

# CLOSING THE GAP MODELLING

## Final Progress Report

### January 2024

MONASH  
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*Monash University acknowledges and pays respect to the Elders and Traditional Owners of the land on which our four Australian campuses stand.*

## Background

The Australian Government is delivering on the commitments made in partnership with First Nations people in the 2020 National Agreement on Closing the Gap. The National Agreement aims to change the way governments work with Aboriginal and Torres Strait Islander communities, organisations and people across the country to accelerate improvements in Closing the Gap. Under the Agreement there are 19 socioeconomic outcome areas and each outcome area has a corresponding specific and measurable target.

The National Indigenous Australians Agency (NIAA) in partnership with the Coalition of Peaks agreed to commission Monash University and the Millennium Institute to build a proof-of-concept model to provide quantitative projections of four to six of the Closing the Gap socio-economic targets. The proof-of-concept model will focus on the First Nations population at the national level and will include built-in drivers of change as well as interlinkages between these drivers and the selected Closing the Gap targets. The proof-of-concept model design and building process will seek to incorporate lived experience of First Nations people. This is supported by the Coalition of Peaks co-chairing the modelling Steering Committee, and the services of a First Nations Advisor (the Advisor) throughout the project.

An Official Order was signed between NIAA and Monash University on 5 December 2022. Monash University has subcontracted the Millennium Institute to support the technical model development until expected project completion in October 2023. In accordance with the agreed project workshop for the project, four project reports are due at regular intervals. As per the contract requirements, this final project report includes:

1. A brief summary of project activities and milestones completed over the course of the project from January to November 2023.
2. A more detailed overview of the final project activities since the previous project report over the period September to November 2023, including the response to the final external model validation from EY and a review of key model limitations.
3. A summary of key features of the model against the requirements set out in the contract.
4. Results from the model for the priority targets with and without scenario interventions.
5. Lessons learned from the project and potential directions for future model development work and research, including an assessment of the feasibility and desirability of expanding the model to cover remaining Closing the Gap targets.

### 1. Summary of Project Activities and Milestones (January-November 2023)

The development of the proof-of-concept model to meet the requirements of the Official Order was completed through twelve main project milestones over the period January to November 2023 (**Annex 1**). The main project outputs include: the proof-of-concept model itself (along with full documentation, coding, data, and user interface), four project reports (including recommendations on the feasibility of a full-scale model), presentations to the Steering Committee and stakeholders and provision of training. Engagement and consultation with NIAA, the First Nations Advisor and the project Steering Committee were undertaken at regular intervals during the project, including through scheduled fortnightly meetings.

Progress made by the modelling team towards the milestones was documented in progress reports submitted in April, June, and September 2023, with the current document providing the final progress report inclusive of all milestones completed as at November 2023. **Table 1** provides a brief summary of the main project milestones and activities successfully completed over the course of the project, which were undertaken in four main phases.

The first phase of the project over the period January to March 2023 advanced the first three project milestones which were completed by end March 2023. This included a stakeholder Model Conceptualisation Workshop held in Canberra on 14-15 February 2023 which provided an opportunity to engage with stakeholders early in the model design process and in particular with First Nations peoples through the Coalition of Peaks and First Nations Advisor. Key deliverables associated with these initial milestones included a draft model conceptual framework and list of data requirements for the model. The draft conceptual framework for the model included a very rich and detailed systems map generated through the stakeholder workshop as well as a more high-level and systemic Causal Loop Diagram (CLD) which identified important feedback loops that drive systems behavior and that needed to be built into the model structure (see **Annex 2**; also available [here](#)). The systems map incorporated important drivers associated with four priority Closing the Gap targets which were reviewed and mapped during the stakeholder workshop. The diagrams also incorporated information from research reports from the Australian Institute of Health and Welfare (AIHW) prepared through the Drivers of Change project.

The second phase of the project was completed over the period April to mid-June and focused on milestones 4 and 5 from the project workplan (**Table 1**). This included compilation of important input and calibration datasets in consultation with NIAA and the First Nations Advisor, initial development and calibration of the system dynamics model, preparation of draft model documentation, and initial model 'walk through' meetings with NIAA (7 June) and the external model validators (16 June). The initial iteration of the Closing the Gap proof-of-concept model (CtG-M) was completed and submitted to NIAA and the external validators on 4 June.

The third phase of the project was undertaken over the period mid-June to end of August and included the external model validation by EY, feedback from project stakeholders, model revisions and enhancements, and scoping activities for the scenario analysis and user interface deliverables (**Table 1** – milestones 7 to 9). This included several meetings with NIAA and the model validation team as well as with project stakeholders, including with workshop participants on 29 August. The formal model validation and stakeholder feedback were used to inform a range of model revisions and enhancements which were made over the period to the end of August. The model validation process was constructive and the overall findings regarding the initial model structure and baseline projections showed that these were appropriate and reasonable, with a range of areas identified for potential model improvements. The modelling team's formal response to the external validation was submitted on 28 August and was also included in the second project report. This also included a comparison of the drivers identified in the stakeholder systems map and the variables included in the CtG-M, as requested by stakeholders (**Annex 3**).

The final phase of the project was undertaken over the period from September to November 2023 and included delivery of the second iteration of the CtG-M which included revisions made in response to the first model validation as well as the model user interface and the model training workshop held in Canberra on 18-19 October 2023 (**Table 1** – milestones 10 to 12). The second model iteration was provided to EY for external validation on 3 October and the validation report was received on 1 November. A range of revisions were made to the model in response to the final validation, as documented in this report. The final project deliverables were submitted to NIAA on 30 November 2023, inclusive of this report, the final CtG-M and supporting documentation, and the response to the second external model validation.

**Table 1. Progress on Project Milestones and Activities – January to November 2023**

| Milestone    | Activities and timelines from workplan                                                                                                                                                                                      | Status                 |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1. Work plan | 1.1 Prepare draft workplan of key milestones and proposed approach for delivery (13 Jan)<br>1.2 Finalize workplan with feedback from NIAA (20 Jan)<br>1.3 Discuss and agree to initial priority set of targets <sup>1</sup> | Completed January 2023 |

<sup>1</sup> As at March 2023, targets 1, 7, 9 and 12 are included.

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                      |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | 1.4 Define model scope and aggregation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |
| 2. Modelling framework and data base                           | 2.1 Initial research and preparation of draft high-level sub-system map and materials for model conceptualization meeting (Feb)<br>2.2 Host model conceptualization participatory meeting for priority Closing the Gap targets (Feb)<br>2.3 Finalize modelling framework diagram including how the targets and drivers are to be built into the model and linked (Feb)<br>2.4 Identify baseline data requirements and data sources (Jan-March)                                                                                                  | Completed Feb-March 2023                                                                                                                                             |
| 3. First project report and presentation to Steering Committee | 3.1 Presentation of model conceptualization to Steering Committee (postponed)<br>3.2 Submit first modelling project report including progress made towards milestones, model structure, database and issues experienced or anticipated, including data availability and gaps (end March)                                                                                                                                                                                                                                                        | Completed March 2023                                                                                                                                                 |
| 4. Initial model and baseline projection                       | 4.1 Based on the conceptual modelling framework, develop the proof-of-concept system dynamics model structure in Stella Architect software incorporating the priority set of targets, drivers and feedbacks (March-May 2023)<br>4.2 Compile timeseries database for model calibration including initialization, input, history and exogenous data files - remaining critical data gaps to be identified and discussed with NIAA (March-May)<br>4.3 Calibrate and optimize the proof-of-concept model and complete baseline projection (end May) | Completed April to mid-June 2023                                                                                                                                     |
| 5. Presentation and report to Steering Committee               | 5.1 Presentation of progress including model structure and baseline projection to Steering Committee (May - TBC)<br>5.2 Submit mid-project progress report including progress made on milestones, model structure, database, baseline projection and issues experienced or anticipated (end May)                                                                                                                                                                                                                                                | Completed. Report submitted and SC presentation on 19 June.                                                                                                          |
| 6. Initial model validation                                    | 6.1 Submit proof-of-concept model to NIAA for third party validation (end May)<br>6.2 Respond to any issues raised through third party validation (June)                                                                                                                                                                                                                                                                                                                                                                                        | Completed. Initial model submitted on 4 June. Validation report received on 3 August. Response to validation report sent on 28 August 2023.                          |
| 7. Scenario analysis                                           | 7.1 Identify and agree to 2-3 combinations of changes in drivers. This will include consideration of the Priority Reforms. (June)<br>7.2 Integrate changes in drivers into the model framework (June-July)<br>7.3 Complete scenario projections with changes in drivers (June-July)                                                                                                                                                                                                                                                             | Completed. Scenario options from NIAA were built into the user interface in September 2023. Results from example scenario simulations are included in this document. |
| 8. Presentation and report to Steering Committee               | 8.1 Presentation of progress including scenario projection results to Steering Committee (July)<br>8.2 Submit second project progress report including progress made on milestones with a focus on the updated model structure and scenario analysis and highlighting any issues experienced or anticipated (end July)                                                                                                                                                                                                                          | Completed. Second project progress report submitted in September 2023. Meeting with project stakeholders on 29 Aug.                                                  |
| 9. Model User Interface and delivery                           | 9.1 Develop model user interface (May-August)<br>9.2 Final calibration of proof-of-concept model (August)                                                                                                                                                                                                                                                                                                                                                                                                                                       | Completed. Second iteration of the CtG-M with model user                                                                                                             |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                   |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | 9.3 Delivery of model and user interface (end August)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | interface delivered on 3 October 2023.                                                                                                                                            |
| 10. Training session                | 10.1 Undertake training session for the operation of the model backend and user interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Completed.</b> CtG-M training held in Canberra on 18-19 October 2023.                                                                                                          |
| 11. Final model validation          | 11.1 Submit model for third-party validation<br>11.2 Respond to issues raised during third-party validation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Completed.</b> CtG-M submitted to EY for second validation on 3 October 2023. Validation report received on 1 November 2023. Response to validation included in this document. |
| 12. Final model delivery and report | 12.1 Prepare final model documentation, coding, database and training materials for user interface<br>12.2 Submit final model and final project report including: <ul style="list-style-type: none"> <li>• results from the model for the priority targets with and without policy interventions</li> <li>• summary of key features of the model against the requirements set out in the contract</li> <li>• model documentation including modelling methodology, structure, code, software information, data and sources, literature references, and instruction/menu for how to run the model and for trouble shooting</li> <li>• an assessment of the feasibility and desirability of expanding the model to cover remaining Closing the Gap targets</li> </ul> | <b>Completed.</b> Final model, documentation, materials etc. submitted to NIAA on 30 November 2023, inclusive of the final project report (current document).                     |

## 2. Final Project Activities and Milestones (September to November 2023)

The final project activities undertaken over the period from September to November included the delivery of the second iteration of the CtG-M including the user interface (UI), training sessions, and second external model validation and response. The CtG-M training workshop was held over two days in Canberra on 18-19 October and was tailored to meet a range of learning objectives developed in consultation with NIAA. The training provided participants with the ability to: (i) understand the fundamental structural components of the CtG-M and to develop basic model structure and import data in Stella Architect software; (ii) use the CtG-M to run simulations and alternative scenarios, both through the UI and directly by changing parameter values in the model; and (iii) present, download and interpret simulation results and perform more advanced modelling features (including optimization and sensitivity analysis). The sessions provided hands-on instruction to the NIAA participants using the Stella Architect software on personal computers. Presentations were also provided by the modelling team on the CtG-M and key findings to date from the model projections.

The second external model validation was undertaken by EY in October 2023 and assessed the appropriateness of the finalized CtG-M and interface as a policy analysis tool and the accuracy of final technical documents. It also verified revisions made to the CtG-M in response to the first validation which evaluated the draft model structure and baseline projections. The validation report found that the overall approach taken to developing the model is suitable for the required purposes within the context of currently available data and associated limitations. The model was considered suitable for producing baseline projections into the future and for scenarios involving long-term shifts in socioeconomic and population factors. Further development of the CtG-M was suggested to extend capabilities for assessing more specific policy interventions. The eight main modules from the CtG-M were considered fit for purpose with some final areas for minor model revisions and final refinements,

including to the user interface. Feedback from NIAA was also received regarding the user interface and has now been incorporated into the final model iteration.

**Annex 4** provides the response from the modelling team to the validation report and other feedback received, including a point-by-point response to the various comments and the revisions made to the CtG-M. This includes a range of final model revisions and enhancements which were made by the modelling team during November 2023 and are reflected in the third iteration of the CtG-M. The second validation report from EY identified three specific issues which were ranked as having a medium-level impact on the model and which required further attention or caveats. These related to the education and housing modules and have now been investigated and addressed by the modelling team in the third iteration CtG-M and documentation. Firstly, in the education module, the data for educational attainment rates, participation rates and enrolment rates was updated to include the latest datapoints released for 2021. This has had a tangible impact on the projections as the latest data points show a considerable slowing of the trend since 2016. The model has been recalibrated to optimize the simulations on the latest data which has also impacted the projections for Target 7 on youth in EET. Secondly, in the housing module, the model parameterization has been adjusted to better account for the effects of housing affordability on future projections for cities and regional areas. The projections for access to suitable housing have also been recalibrated. These revisions have not resulted in a substantive change to the projections for Target 9a on appropriately sized housing or the impacts of the social policy lever in cities and regional areas where large shares of the population reside in private dwellings. We return to this issue below in our review of remaining limitations and potential areas for further development in each of the main modules (see Table 4).

A number of other refinements were also made in the last round of revisions to improve the model calibration and future model projections. This includes changes to the formulation for adjusting assumptions in the model which removed the sensitivity multipliers and replaced them with annual growth rates. This provides a more intuitive mechanism for adjusting assumptions in the UI and has also improved the results from the sensitivity analysis. Some refinements were also made to the formulation for relationship between healthy diets and income which now uses income percentiles and a quadratic function to improve the calibration. Adjustments were also made to future baseline assumptions regarding exogenous health variables, which are now based on the recent trend and use an annual growth rate formulation. This results in more realistic assumptions and intuitive results from policy scenarios that use these levers. Some modifications were also made to the child protection module to recalibrate child substantiation projections to changes in drivers from other modules (e.g. access to suitable housing) and to adjust the formulation for calculating family violence. This has reduced the sensitivity of the projections to changes in family support which was very high in the previous model iteration. Overall, these revisions have improved the calibration for a range of key model variables, as evidenced by the revised error statistics included in the model document.

### 3. Summary of key features of the CtG-M against the project requirements

In **Table 2** we provide a summary of the key features of the CtG-M against the original requirements for the proof-of-concept model as set out in the Official Order. The model documentation provided with the model includes a more detailed summary of the model development process (e.g. consultation, data collection, calibration, validation, sensitivity procedures) as well as an overview of the model structure, key assumptions and datasets, baseline projections, and validation and sensitivity analysis results.

As noted in **Table 2**, the CtG-M successfully meets the core technical requirements specified for the proof-of-concept model and provides a new tool that complements the existing evidence base of assessments and analyses undertaken on Closing the Gap targets. As a pilot project, the development of the proof-of-concept model has focused on delivering a robust model structure that incorporates four agreed priority targets along with key socio-economic and cultural drivers and dynamic interconnections between these drivers and the targets. The model design incorporates lived experience of First Nations peoples and is underpinned by empirical research and literature review

and a broad range of official national datasets. The baseline projection through to 2046 represents the trajectory of the selected Closing the Gap targets in a 'business-as-usual' scenario with no new or alternative policy interventions. The model also supports scenario analyses which alter key drivers of change to explore their effects on the target outcomes. Model validation included behavioural and structural validation which included a range of summary statistics and measures of goodness-of-fit, and sensitivity analysis of the model projections to changes in exogenous assumptions was also undertaken to provide an indication of uncertainty.

**Table 2. Summary of the CtG-M against the model requirements from the Official Order**

| Model Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Summary of the CtG-M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The proof of concept model must include the agreed four to six Closing the Gap targets for First Nations people (selected from an initial shortlist and including life expectancy), with built-in key drivers of change, the interlinkages between these drivers, and potential interlinkages between the targets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p><b>Requirement met.</b> The CtG-M currently includes four priority targets from a list agreed to by stakeholders. These are: Target 1 (life expectancy); Target 7 (youth in EET); Target 9a (appropriately sized housing); Target 12 (children in OOH). The current version of the CtG-M also includes the capability to model four additional targets with some limited revisions: Target 5 (Year 12 completion); Target 8 (% employed 25-34); Target 10 (incarceration); Target 11 (youth detention).</p> <p>The model incorporates a broad range of key drivers of change as identified by stakeholders during consultations as well as the AIHW drivers of change reports. This includes important socio-economic drivers as well as cultural drivers which are quantified in the eight main CtG-M modules: population, fertility, mortality, health, education, housing, child protection and income.</p> <p>All drivers are dynamically linked to the Closing the Gap targets in the model through complex feedbacks so that changes in drivers influence target outcomes.</p> |
| <p>The drivers and the interlinkages must be underpinned by theory as well as empirical evidence. We expect the model to draw on the abovementioned AIHW analysis.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p><b>Requirement met.</b> The CtG-M is underpinned by theory as well as empirical evidence and lived experience of First Nations people. The identification of important drivers and feedbacks was initially informed by the AIHW analysis and stakeholder consultations which conceptualized the model structure. The model development was also informed by the empirical research and literature review from the AIHW research reports for each of the targets, as well as by research, literature and data contained in the AIHW Health Performance Framework.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>The model must be able to simulate/project the impact of changes in the relevant key drivers on the projections of selected Closing the Gap targets.</p> <ul style="list-style-type: none"> <li>• The proof of concept model should estimate the impact of the changes in drivers that the Closing the Gap Implementation plans seek to influence. For example, the model should be able to estimate the effect on the different targets of a given reduction in smoking rates or increase in literacy levels. The proof of concept model is not required to be able to evaluate the fiscal cost or effectiveness of specific policy levers that could be used to achieve these changes in drivers.</li> <li>• It would be strongly preferable for the model design process to incorporate lived experience of First Nations people.</li> </ul> | <p><b>Requirement met.</b> The CtG-M is capable of simulating the impact of changes in drivers on the selected Closing the Gap targets. This can be done through the Stella Architect software in the model 'back-end' as well as through the model user interface.</p> <p>As noted above, the model development process included a stakeholder systems mapping workshop as well as advice from a First Nations Advisor which supported the incorporation of lived experience of First Nations people into the model design.</p> <p>Sensitivity analysis was undertaken on the model baseline projections to provide confidence intervals associated with projections for the Closing the Gap targets. This provides an indication of uncertainty in the model projections or the sensitivity of the projections to changes in uncertain future exogenous assumptions.</p>                                                                                                                                                                                                              |

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>It would also be preferable if the model can indicate the uncertainty in its projections.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>The modelling framework must be extendable to cover most, if not all, 17 Closing the Gap targets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p><b>Requirement met.</b> The modelling team has undertaken an initial review of the remaining socio-economic targets to evaluate the potential to extend the model to incorporate these targets (see discussion below). Overall, this is considered feasible for the majority of remaining targets, however it would be challenging for Target 4 (children developmentally on track across five domains) due to the complexity of the composite indicator as well as Target 17 due to the lack of data and complexity in formulation of the indicator.</p>                                                                                                                                                                                                                                                                                                      |
| <p>The proof of concept model should focus on national Closing the Gap target outcomes.</p> <ul style="list-style-type: none"> <li>Noting the significant differences in outcomes between remote and non-remote areas, the proof of concept model should consider accounting for remoteness using a marker.</li> <li>The Supplier(s) may want to consider whether their approach is geographically scalable. A future full scale model could incorporate state and territory outcomes and state and territory government policies.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         | <p><b>Requirement met.</b> The CtG-M has a national scale which is disaggregated by remoteness across three categories: Cities, Regional, Remote. This disaggregation is incorporated throughout the model into all of the eight modules.</p> <p>It would be technically feasible to incorporate further geographic disaggregation into the model (i.e. in terms of developing the model structure to support this), however quantification would likely face serious data limitations and challenges in terms of layering datasets by state/territory and remoteness areas. Given the data challenges faced during the pilot phase, this approach may not be feasible from a data perspective.</p>                                                                                                                                                               |
| <p>The baseline representation of the Closing the Gap targets in the model must align with the Productivity Commission's most up-to-date reporting on the Closing the Gap targets, as much as possible.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p><b>Requirement met.</b> Data used in the model for the Closing the Gap targets has been drawn from the PC Dashboard, while a broad range of official national datasets are used to calibrate the model or as exogenous inputs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>The simulations/projections of the outcomes of the Closing the Gap targets can be annually or every five years from 2026 (to include 2031), and through to 2046, to provide policy insight into longer term effects of government policy interventions.</p> <ul style="list-style-type: none"> <li>The longer term projections reflect the life cycle nature of the Closing the Gap targets, as well as how long policies take to have an impact. For example, the intergenerational effects of better educational outcomes for children.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                               | <p><b>Requirement met.</b> The CtG-M uses an annual timestep commencing in 2006 and with annual projections through until 2046. This provides policy insights into the longer-term effects of government interventions which change drivers in the model.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>The model should focus on First Nations people only. Most of the Closing the Gap targets have been negotiated as goals for First Nations people, rather than as gaps between First Nations and non-First Nations people. For example, target 2 is to increase the proportion of First Nations babies with a healthy birthweight to 91 per cent by 2031.</p> <ul style="list-style-type: none"> <li>Life expectancy is the only target that is set as a gap between First Nations and non-First Nations people. The Supplier should clarify the data source for non-First Nations people's life expectancy projections, and the approach to ensure adequate access for the data to be included in the model.</li> <li>In addition to the delivery of a proof of concept model (including full documentation, coding, data, and the menu for running the model), the Supplier(s) must also build and deliver an interface</li> </ul> | <p><b>Requirement met.</b> The CtG-M focuses only on the First Nations population. This includes a population module which simulates the First Nations population disaggregated by age, gender and remoteness. Population dynamics include endogenous simulation of fertility and mortality with exogenous assumptions regarding internal migration. The CtG-M is calibrated using ABS population projections (Series B).</p> <p>The CtG-M uses exogenous data on non-First Nations people to calculate the life expectancy gap for Target 1. All sources of model data are identified in the CtG-M Documentation.</p> <p>The CtG-M includes a user-friendly model interface which enables non-technical users to test different scenarios, adjust assumptions, and view results. The interface is available in the Stella Architect software but can also be</p> |

|                                                                                                                                              |                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| (visualisation) of the model to enable policy makers to test different policy scenarios. This interface should be intuitive and easy to use. | hosted online for broader access through the ISEE Exchange. |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|

## 4. Results from the model for the priority targets with and without scenario interventions.

### 4.1 CtG-M baseline projections to 2046

The results from the final CtG-M baseline projections to 2046 for the four Closing the Gap targets are provided in the charts below and are also available for viewing in the model user interface and model documentation. The baseline projections are derived from the model structure, drivers and complex feedbacks as well as future assumptions for a range of exogenous variables which are used as inputs to the model. The model documentation includes a broader discussion of the long-term baseline projections and the main drivers that influence the outcomes for the different targets which were also highlighted through the sensitivity analysis.

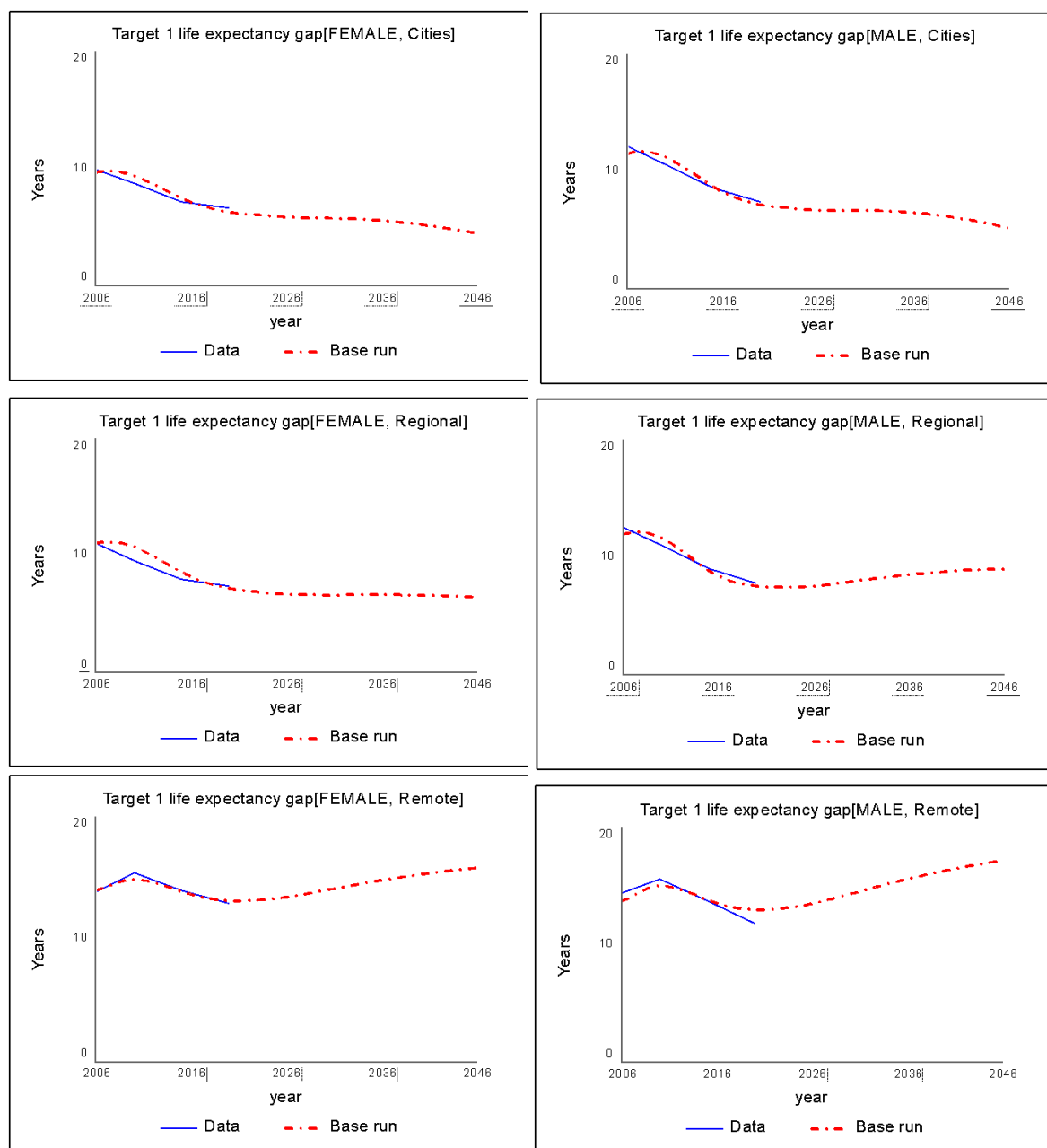


**Figure 4.1 Baseline projections to 2046 for Target 1: Gap in Life Expectancy between Indigenous and non-Indigenous population in years by gender and remoteness (Base = baseline; Data = historical data)**

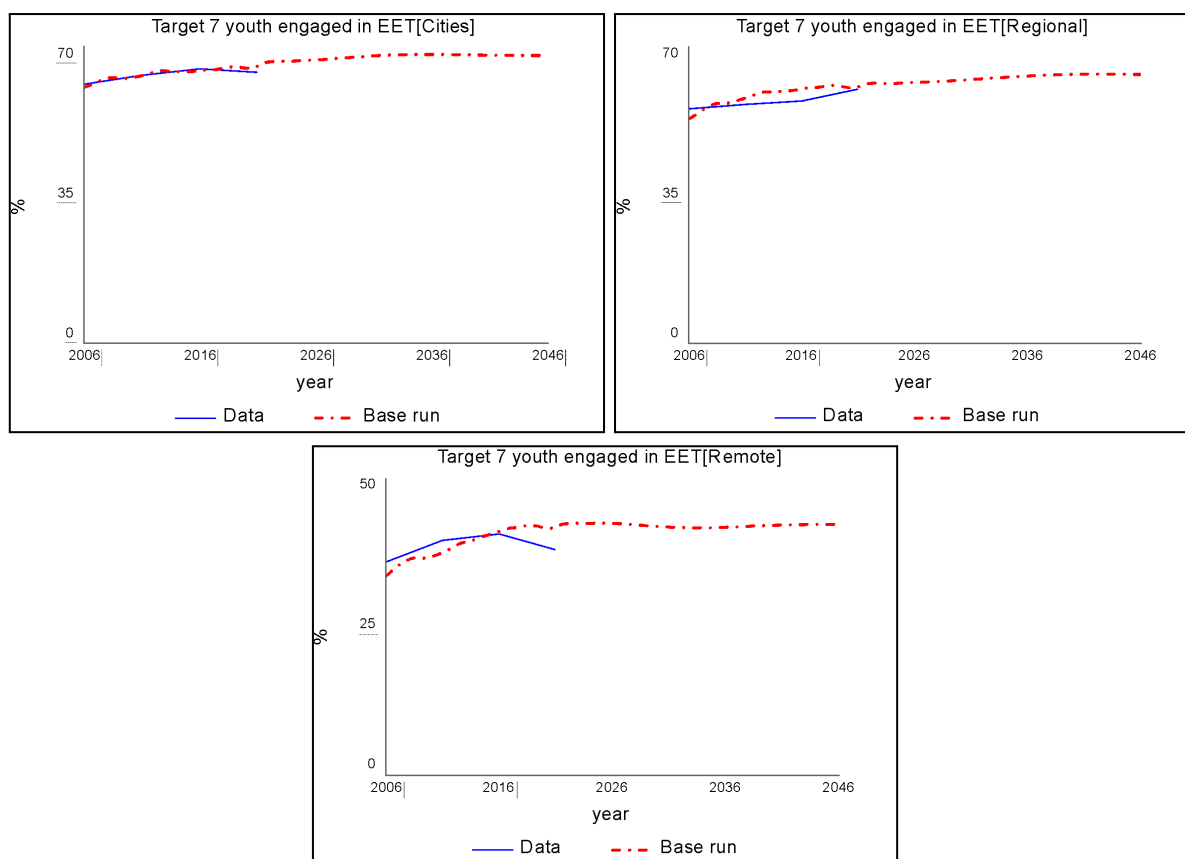


**Figure 4.2 Baseline projections to 2046 for Target 7: Youth engaged in employment education and training (%) by remoteness (Base = baseline; Data = historical data)**

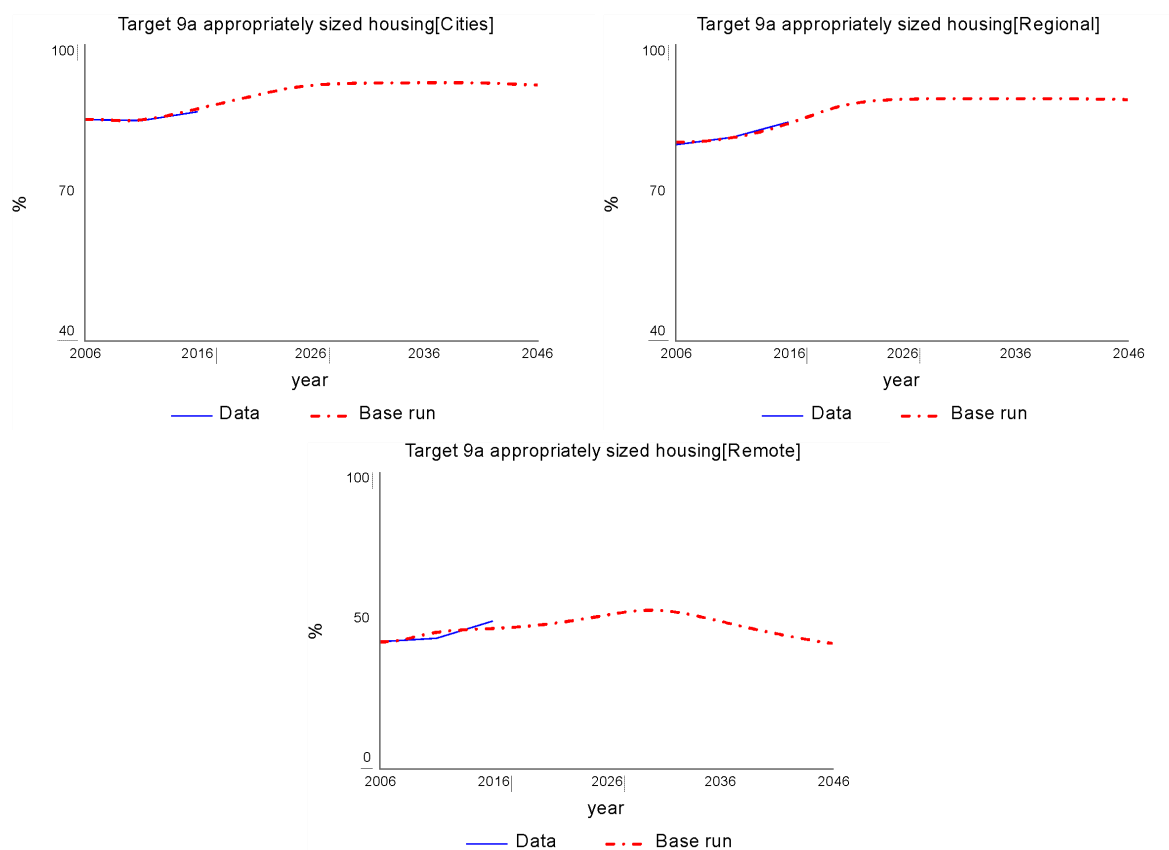


**Figure 4.3 Baseline projections to 2046 for Target 9a: Indigenous population living in appropriately sized housing (%) by remoteness (Base = baseline; Data = historical data)**

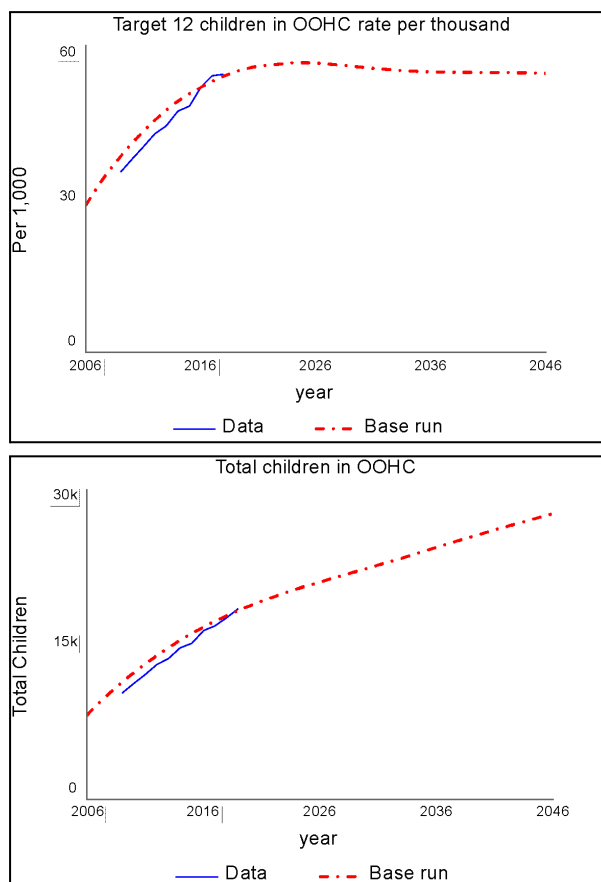


**Figure 4.4 Baseline projection to 2046 for Target 12: Indigenous children in out of home care, rate per thousand (and total)**

## 4.2 Scenario projections for housing and health targets.

The CtG-M also includes some limited policy scenario capabilities for simulating the effects of changes in future assumptions relating to the evolution of exogenous variables in the model. In line with the technical requirements for the proof-of-concept model, the CtG-M includes the capability to run policy scenarios for three combinations of drivers nominated by NIAA which relate to social housing supply, health staff committed to Indigenous healthcare, and availability of Aboriginal Community Controlled Health Organisations (ACCHOs). Changes in these policy assumptions can be made in the model and the user interface by changing (i.e. increasing or decreasing) assumptions regarding future annual growth rates relative to the baseline projection. The model also includes several other exogenous variables which relate to additional socio-economic and cultural drivers. The ability to adjust future assumptions for these drivers and to explore their effects on the model simulations is also available through the model user interface. These exogenous variables include racism and discrimination, connection to country, family support, per capita GDP growth rates, and social security payments.

The charts below provide some indicative results from the CtG-M incorporating scenario interventions for housing and health. For scenarios that increase the supply of social housing, the main effect on the priority targets is for Target 9a on the proportion of the population in appropriately sized housing (**Figure 4.5**). For the purposes of comparison, we ran a policy scenario that increases the annual growth rate for the supply of social housing in remote areas by 5% above the baseline over the period through until 2046 (**Figure 4.5**, (a) top left panel). In the model, the increase social housing supply provides dwellings for the population in need of social housing, which increases social housing occupants and the total Indigenous population with housing (**Figure 4.5**, (b) top right panel). The simulation results show that the increased supply of social housing reduces the housing occupancy stress which results in an improvement in the population living in appropriately sized housing up from 42.4% in the baseline projection to 60.9% in the housing scenario (**Figure 4.5**, (c) bottom left panel). The effect of the policy is more marginal for the total Indigenous population, where the policy scenario projects 86.2% by 2046 compared to 83.8% in the baseline projection (**Figure 4.5**, (d) bottom right panel). Similar scenarios that increase supply of social housing in cities and regional areas were seen to have limited effects on crowding due to the larger share of population in private housing, greater access to a private housing market, projections for increased incomes, and lower crowding rates.

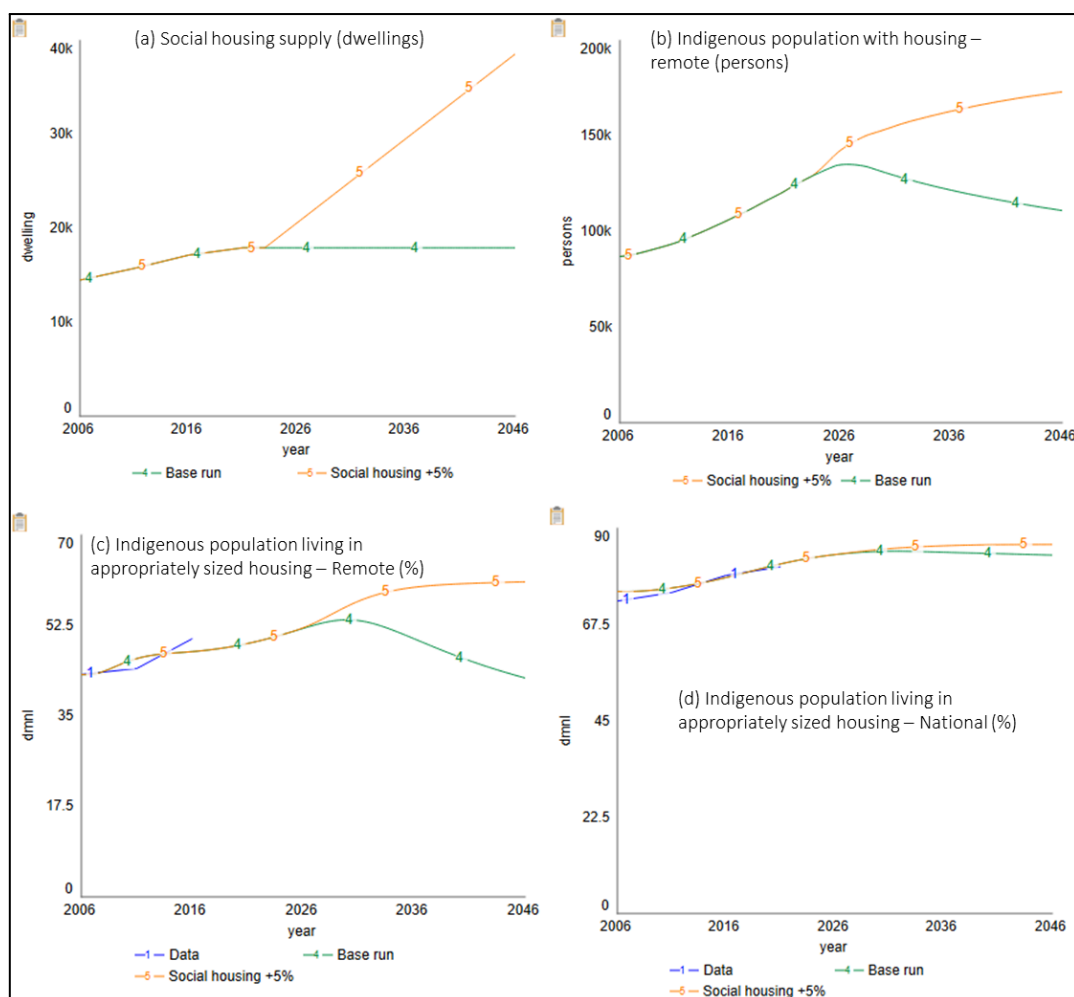


**Figure 4.5 Projections for social housing supply scenario (orange) versus the baseline (green) – increasing supply by 5% per annum above the baseline in remote areas. Top left panel:** remote areas social housing supply (thousands of dwellings); **top right panel:** Indigenous population with housing; **bottom left panel:** percentage of population living in appropriately sized housing in remote areas; **bottom right panel:** percentage of population living in appropriately sized housing national average.

For scenarios that increase health staff committed to Indigenous healthcare and availability of ACCHOs, the main effect on the outcome targets is for Target 1 on life expectancy (**Figure 4.6**). In the model, the increased supply of health staff for Indigenous health services (**Figure 4.6(a)**) increases the access to health services in cities (b), regional areas (c) and remote areas (d). For cities and regional areas, access is projected to reach a saturation point (100%) before 2046 and earlier in regional areas. For remote areas, the saturation point is not reached by 2046.

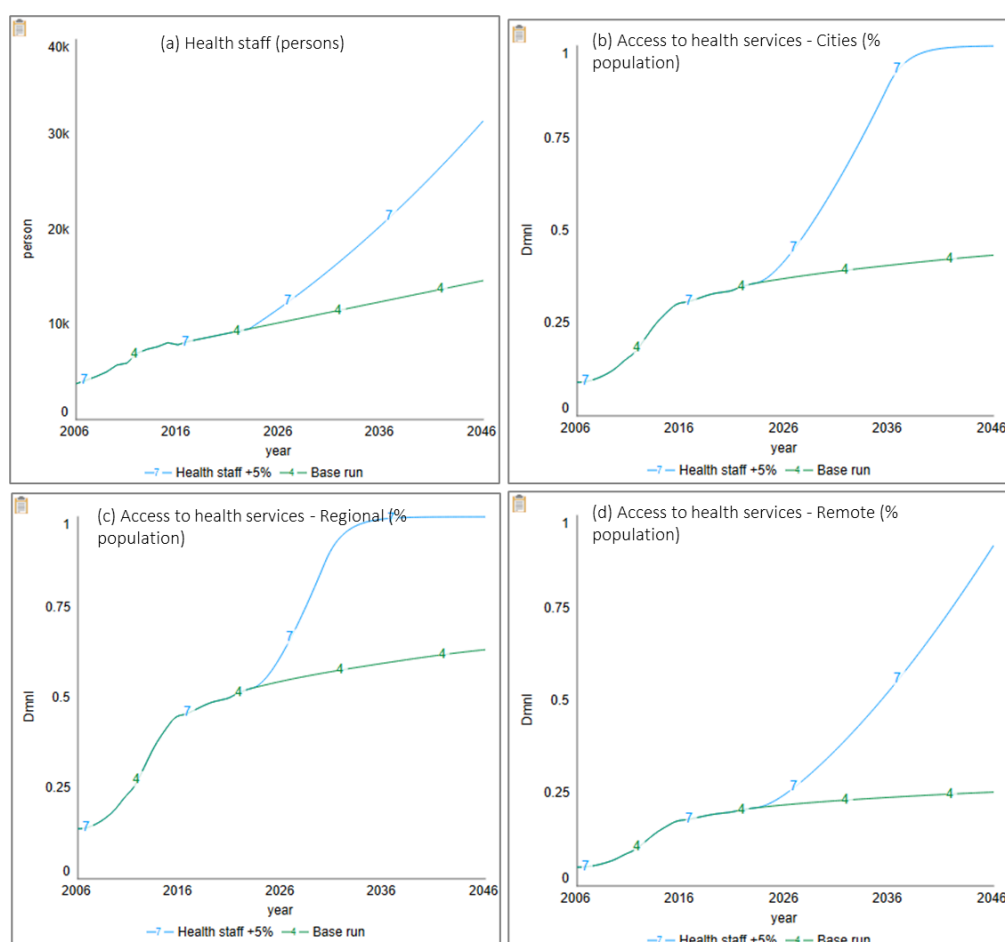


**Figure 4.6 Projections for the supply of health staff for Indigenous health services (blue) versus the baseline (green) – increasing supply by 5% per annum above the baseline in all areas.** (a): projection for the number of health staff (persons); (b) population with access to culturally appropriate health services in cities (%); (c) population with access to culturally appropriate health services in regional areas (%); (d) population with access to culturally appropriate health services in remote areas (%).

The increased access to health services results in a decline in mortality rates which flows through to beneficial effects on life expectancy over time. The scenario projections for increased supply of health staff result in an improvement in projections for Target 1 life expectancy gap across all three regions, but with larger improvements in cities and remote areas (**Figure 4.7**).

The user interface for the CtG-M allows users to run similar scenarios as well as to adjust a broader range of model assumptions and explore their effects on the outcome targets and a range of other model variables. This provides a simpler and more user friendly tool for policy scenario analysis.

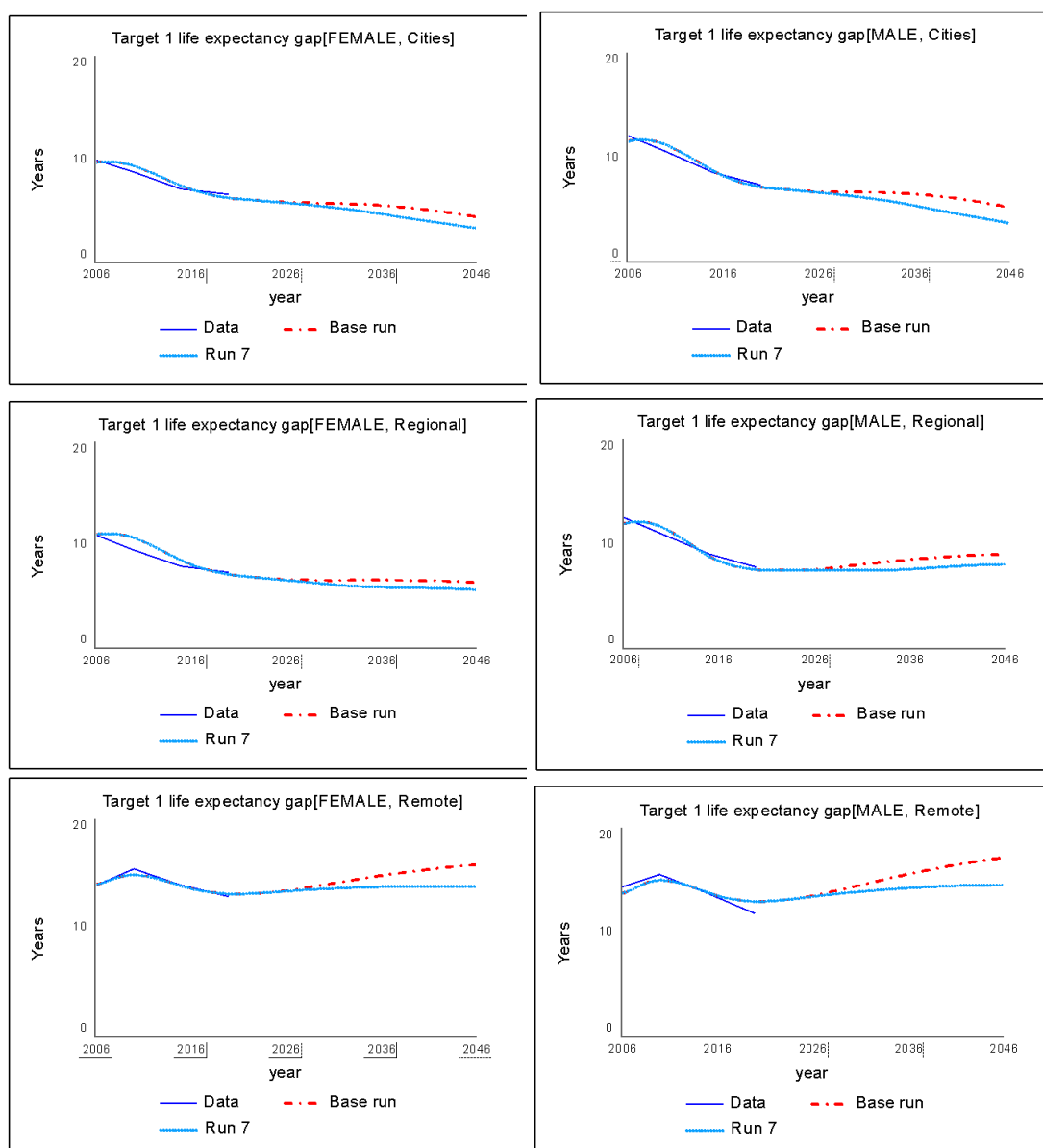


**Figure 4.7 Projections for Target 1 Life expectancy gap – increasing the supply of health staff.** Charts show results disaggregated by gender and remoteness (left panels – female; right panels – male).

## 5. Further model development and lessons learned

### 5.1 Overall strengths and limitations of the CtG-M

The CtG-M is designed to simulate key drivers for four selected Closing the Gap targets, the interlinkages between drivers and targets and to produce projected outcomes to 2031 and 2046, accounting for remoteness (Cities, Regional, Remote) where possible. The outputs of the model are intended to form part of the evidence base to inform policy analysis and decision making. As noted above, the CtG-M meets the technical requirements for the project. The current model has the capability to simulate anticipated impacts of selected policy options nominated by NIAA as well as a range of other assumptions. However, as with any model, it has strengths and limitations which are important to keep in mind when interpreting the model outputs. Many of these are highlighted in the external model validation reports.

Key strengths of the model include that it is based on a broad evidence base and uses a flexible and transparent modelling approach whereby the fundamental model structure and assumptions are clearly accessible and visible to model users. The selection of drivers and the formulation of feedbacks and dynamics in the model were based on stakeholder input which included lived experience of First Nations peoples and are also justified and supported by the empirical and theoretical literature. The documentation supporting the model provides a clear and transparent overview of the model structure, key assumptions, data sources and data limitations and also supports understanding of the level of uncertainty in the model projections through a detailed description of sensitivity analysis results and the main drivers contributing to these shifts. The user interface tool provides an easy-to-use design that highlights key model elements (such as the model structure, high level dynamics and limitations), provides a graphical summary of outputs for the four selected targets, and provides the user with the ability to explore simulated outputs under their own scenario and sensitivity inputs.

Overall, the external model validation found that the CtG-M is fit for purpose for making long-term projections of Closing the Gap targets through until 2046. Specifically, the final validation report indicated that the model produces baseline and scenario projections that appear reasonable and can help to inform understanding of potential policy impacts. The model also has a strong potential to be a “transparent box” that can support ongoing collaboration in the development and implementation of policy responses, and the interface supports socialisation and communication of outputs to a broader audience. Overall, the validation report found that the model provides value to aid decision making within the context of its proof-of-concept scope and limitations, and supports a key project objective of testing the feasibility of a full-scale model.

However, the scope of the model has inherent challenges arising from the lack of available data on key aspects of drivers. As a result, the model relies on some assumptions informed by expert judgement to fill key data gaps or excludes drivers where data is unavailable. This introduces uncertainty into the model results which is difficult to fully quantify, particularly where it stems from datasets used to calibrate the model. Historic data gaps and more limited coverage of remoteness areas for some drivers contribute to uncertainty around historic trends which flows through to long-term projections. The high-level modelling approach may also gloss over some important dynamics at lower scales, for example in terms of differences in policies in different jurisdictions.

The need to ensure a simple and user-friendly model interface means that it may be difficult for lay users to fully appreciate the method and uncertainty in the results. The complexity of the model dynamics may lead to outputs that appear different from the user’s expectations. Guidance from more experienced users around interpretation, what can reasonably be inferred from outputs, relative levels of uncertainty and key limitations may help users to understand the model structure and underlying narrative.

While the method used to develop the model is suitable for modelling medium- to long-term changes in socio-economic and other drivers and their effects on target outcomes, it is not well-suited for modelling short-term policy changes and effects. While model users can change a range of assumptions and explore their effects, the current scenario options remain limited, particularly in the education and child protection modules. Use of the model to support decision-making in practice will require clear communication of limitations and uncertainty and continued stakeholder collaboration.

## 5.2 Remaining data gaps and further development of existing modules

With these broader strengths and limitations in mind, Table 4 provides a brief overview of some of the main data gaps and limitations associated with each of the main modules in the CtG-M along with potential options for further model improvements.

**Table 4. Data gaps, limitations and potential areas for module improvements**

| Module | Data gaps, limitations and potential areas for module improvements |
|--------|--------------------------------------------------------------------|
|--------|--------------------------------------------------------------------|

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Population, fertility and mortality | <p>The model validation found that these modules are fit for purpose and provide reasonable outputs. This provides some confidence in the population and life expectancy projections which are crucial as they are used throughout the model.</p> <p>Key datasets used in these modules include ABS population projections (by age, sex and remoteness), birth and fertility datasets, mortality rates by age and cause, and Indigenous and non-Indigenous life expectancy. Overall, these datasets have reasonable time series available and appear comparable and consistent. However, the data used for calibrating the population model and population projections should be updated when the latest 2021 Census data becomes available. The projections could also be enhanced incorporating age-specific migration assumptions used by ABS in their projections, if available. Data on mortality rates could also benefit from expert input to ensure consistency with other datasets used in the model.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Health                              | <p>The model validation found this module to be fit for purpose and to provide reasonable outputs. The module includes a range of important drivers and associated proxy datasets including for the use of healthcare, prevalence of healthy diets, disability and substance use, psychological distress, racism and discrimination, connection to country, health staff committed to Indigenous healthcare and ACCHOs. The selection of proxy datasets was undertaken in consultation with NIAA and the First Nations Advisor to determine the relevance and appropriateness of different datasets. These were also evaluated based on the availability of time series and necessary disaggregation. Despite this, a number of data gaps and limitations remain which contribute uncertainty to the model projections and which could be prioritized for further consideration:</p> <ol style="list-style-type: none"> <li>1. The data on racism and discrimination and connection to country used in the health module (and elsewhere in the model) is particularly limited. Data gaps for these cultural drivers are considered of high priority for further data collection work given their potential importance for target outcomes and the availability of only a single data point which prevents effective calibration or the determination of a trend. Due to the lack of timeseries data, assumptions were made regarding the historic trend of these variables which introduces additional uncertainty into the model. Potential options for addressing these issues include: <ul style="list-style-type: none"> <li>- Identification of alternative proxy datasets (e.g for racism and discrimination) with a timeseries extending back to 2006 (or at least with several data points to establish a trend).</li> <li>- Collecting additional future data points for the current proxies and reviewing the assumptions used to establish the historic trend with stakeholders and experts.</li> <li>- Using literature review, expert analysis and judgement to determine a suitable trend for these exogenous variables or to endogenize them in the model via feedbacks with other variables.</li> </ul> </li> <li>2. Data used for prevalence of disability does not include population below 15 and the non-remote category is not disaggregated. There also appear to be inconsistencies in the trend data for some categories possibly due to definitional changes. Expert review of this dataset is recommended.</li> <li>3. Data on prevalence of substance use shows a rapid increasing trend in remote areas while the timeseries for regional and cities is not disaggregated (i.e. it is grouped as 'non-remote') and shows high volatility between datapoints. This variable is quite influential in model projections for remote areas and further review of this dataset is warranted to verify if a better alternative is available with disaggregation for all areas of remoteness. Consideration could also be given to including alcohol/tobacco use datasets to complement substance use.</li> <li>4. Data on psychological distress is used as a partial proxy for wellbeing (or a lack thereof). The dataset used (high/very high distress) also shows high volatility. Further review of this dataset and potential alternatives is also warranted given its potential significance and multiple links in the model.</li> </ol> |
| Education                           | <p>The final model iteration incorporates additional timeseries data which addresses the findings of the model validation. The module and its outputs are considered fit-for-purpose and reasonable. Datasets used in the education module include for primary, secondary and tertiary enrolment and completion rates which provide the main data inputs for model calibration. The final model calibration incorporates the latest Census data for 2021 for these variables and the module could be further calibrated by drawing on datasets for education participation rates, if a full timeseries is</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <p>available. The module does not currently support policy scenarios and these capabilities could also be further developed.</p> <p>The module could also be further developed to include additional Closing the Gap targets. For example, the module is relatively granular and could be used to support modelling of Closing the Gap Target 5 on secondary education attainment with minor refinements. There is also potential to further develop the module to incorporate early childhood education levels (e.g. for Target 3) and tertiary completion rates (Target 6), or to enable policy scenarios such as improving student retention rates. This may require further consideration of the approach to modelling dropout rates to support calibration using available datasets. Projections for scenarios relating to the Priority Reforms would also require further refinement to dynamics involving these factors, such as racism and access to culturally appropriate education. An alternative would be external adjustments to other inputs representing the outcome of reforms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Housing          | <p>The model validation found that the housing module was considered fit-for-purpose with reasonable baseline projections, along with some areas for future refinements. Datasets used in the housing module include for rental costs, social housing supply, total dwellings occupied by Indigenous people, Indigenous population in crowded housing, and dwellings of unacceptable standards. There are a range of different datasets and tables available on dwelling characteristics, tenure type, standard of housing, housing suitability and overcrowding. There are some inconsistencies between these tables, for example in terms of the total number of households and population in different tenure types or other categories which are difficult to reconcile. For example, Table 1.2 in ABS dwelling characteristics has total Aboriginal and Torres Strait Islander household in 2016 as 263,037 whereas Table 1.2 in tenure and landlord type gives total households as 252,868. Similarly, ABS data on the population living in appropriately sized housing (Table 1.2; 541,050) is different from the housing data based on Census in the HPF (2.01 Housing) on the Indigenous population by housing tenure type (Table 2.01.20; 586,863). This introduces additional uncertainty into the projections for the housing module, and priority has been given to calibrating the main outcome indicator in the module relating to the proportion of population living crowded housing which is used for Target 9a.</p> <p>The proof-of-concept housing module also uses a high-level representation of the housing market dynamics and housing stock in Australia. The projections for remote areas show sensitivity to changes in social housing supply which is intuitive given the share of population in social housing in these areas. However, projections for regional areas and cities show limited sensitivity to changes in social housing supply as these areas rely more on the private housing market and dynamics and have a smaller share of population in social housing. Given the high priority placed on this module for future scenario and policy analysis, it would be worthwhile reviewing this module with stakeholders and experts to 'sense check' the current model structure, datasets used, as well as the future projections for social and private housing supply. The results could also be compared against housing market projections and analysis from other studies to check for consistency. This could help to identify priority areas for further development of the module to ensure that it is responsive to policy needs.</p> |
| Child protection | <p>The model validation found the child protection module to be fit-for-purpose and with reasonable baseline projections, subject to additional caveats around limitations. Datasets used in the child protection module include for Indigenous children in OOHC, substantiations, youth under justice supervision, contact with the criminal justice system, experience of family violence, and family support. Data on Indigenous children in OOHC and subject to substantiations has a reasonable timeseries but is not disaggregated by remoteness. Proxies used for some of these variables also have limited data series. In particular, the dataset used for family support is considered only a partial proxy and has a limited timeseries available.</p> <p>This module is also affected by limited data for key drivers (e.g. family support, substance use) and external factors are difficult to reflect in projections (e.g. policy and operational shifts, variations in data records). The approach for this module is high-level and there is additional uncertainty associated with future projections given the complexity of the child protection system. Modelling of scenarios relating to specific changes in the child protection system are not yet fully supported and would require further refinements. This could benefit from a more detailed model structure for substantiations, OOHC entries, exits and duration. Further expert and stakeholder input could</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | <p>be used to shape further model developments and review existing drivers and datasets, including for family support and associated dynamics.</p> <p>Noting the comments from EY and also the outcomes from the sensitivity analysis conducted for the previous model iteration which showed very high sensitivity of the projections to changes in family support, some further refinements have been made to the module and it has been recalibrated. This includes some adjustments to important drivers (e.g. access to suitable housing and psychological distress) and recalibration of the family support driver. This has reduced sensitivity of the projections.</p> <p>There is also potential for the module to simulate additional Closing the Gap targets with some further refinements. For example, Target 10 on incarceration rates and Target 11 on youth detention.</p>                                                                                                      |
| Income | <p>The validation found the income module to be fit-for purpose with reasonable projections. Datasets used in the income module include for the employment fraction, average per capita income, population share by quintile, social security payments, and GDP growth rates. Due to the limited availability of disaggregated data (by remoteness and quintiles) relating to personal income, data on mean equivalised gross weekly household income is used as a proxy. Data on income distribution is particularly limited, and population shares by income quintiles was used to calibrate lower quintile income.</p> <p>Potential areas for further data improvements for the income module would include incorporating Census data on youth employment rates and, if available, sourcing data on income distribution. There is also potential for the module to simulate additional Closing the Gap targets with some further model development. For example, Target 8 on employment.</p> |

### 5.3 Feasibility of extending the CtG-M to incorporate the remaining socio-economic targets

A key objective of the proof-of-concept model was to test the feasibility of extending the model to incorporate all or most of the socio-economic Closing the Gap targets. The modelling team has conducted an initial review of the remaining targets to evaluate the technical feasibility of incorporating them into the model. In **Annex 5**, each of the 15 remaining targets are ranked (from 1 to 3) based on this initial assessment as follows:

- 1. Low hanging fruit** - includes targets that are largely addressed by the current model structure. These may not require further stakeholder mapping but would require some model refinements.
- 2. Feasible targets** - includes targets that would require further model extensions (e.g. new modules) and a process to identify drivers (e.g. stakeholder mapping; AIHW reports; data compilation; literature review). Some of these are 'policy' targets which may be better introduced as exogenous variables (labelled as '2P').
- 3. Very challenging targets** - include targets that are not realistic due the methodological complexity or data issues.

This initial assessment does not yet consider data availability and a more in-depth feasibility assessment would be needed to evaluate these aspects. However, based on this initial assessment, four targets are identified as low-hanging fruit and could be developed without significant modifications to the model, a further eight targets are considered feasible with further model extensions, while two target are considered to be very challenging and unlikely to be feasible (see **Annex 5**).

### 5.3 Lessons learned from the proof-of-concept phase and key areas for future development

As noted above, the model development process involved a range of challenges and lessons learned. There were differences between the importance given to drivers of Closing the Gap target outcomes identified in existing reports and analyses when compared with perceptions of stakeholders. It was important to ensure that a broad suite of key socio-economic and cultural drivers was translated from the initial conceptualisation and systems maps to the quantitative model. This was challenging in a number of instances where datasets were missing or where there were large gaps in timeseries for proxy datasets. As a result, some drivers of importance to stakeholders could not be quantified in the model, while others (e.g. racism and discrimination, connection to country, family support etc.) have limited time series which introduces uncertainty into their modelled effects on target outcomes. Given the importance of cultural drivers in the model conceptualisation process as well as their importance in influencing target outcomes as evidenced through the sensitivity analysis and projections, it is recommended that further development of these drivers in the CtG-M is warranted. The current model treats many of these drivers as exogenous and further model development should also consider how these critical drivers can be endogenized given they represent an important part of the story and potential leverage point for systems change. This could also be done in a way that increases opportunities for modelling the effects of the Priority Reforms.

There is a complex data landscape and the AIHW Health Performance Framework provided a critical clearing house of relevant datasets that could be used in the model. Where possible, data from Census was given preference over other data sources, however some key datasets (e.g. population projections) based on the latest 2021 data are yet to be released. Some thematic areas (e.g. health) are also better covered by datasets than others. Potential inconsistencies between different data sources were also identified in some cases and it is difficult to access assumptions or limitations that could explain these differences. For some datasets, the high volatility in timeseries suggests that these may result from definitional changes or other limitations. Greater access to assumptions used in generating timeseries and projections (e.g. migration assumptions for population projections) or input from subject matter experts could help to improve the datasets used in the model. This report highlights some priority areas where further data work could be undertaken which could improve the model calibration (e.g. see Table 4).

A key assumption of the modelling approach and parameterization is that future relationships between drivers and targets reflect past experience. This is a reasonable assumption but it will not always be the case, as events such as the COVID-19 pandemic have demonstrated. The general approach used for calibration adopts the same elasticities for the different sub-regions which worked well overall, however the calibration for remote areas was often more challenging than for other areas. However, this may result from gaps and inconsistencies in the underlying data rather than the parameterization approach. Improving key calibration datasets therefore represents an important initial priority for further model enhancements.

The process undertaken to develop the proof-of-concept model was time constrained and the project scope and activities were largely predefined by the agreed technical requirements and work schedule. As a pilot project, the focus has been on identifying and modelling important high-level drivers of change in the four priority targets rather than on achieving a high-level of detail in key sectors and processes. Further, the current model is not yet designed to undertake detailed policy analysis, but rather to explore scenarios that change some key drivers of interest and their effects on target outcomes. A strength of the process was the early engagement of First Nations stakeholders in the conceptualization of key drivers and interlinkages with the Closing the Gap targets. However adequate consultation with stakeholders is also time and resource intensive and using a similar workshop-based engagement approach may require an unrealistic time commitment for participants.

As noted by the external model validators, the systems modelling approach used in the project means that the CtG-M has a strong potential to be a “transparent box” that can support ongoing collaboration

in the development and implementation of policy responses. The collaborative exercise with key stakeholders to identify the drivers and mechanisms informing the model design provided a useful opportunity to commence this engagement. Any further plans to develop or extend the model in a subsequent phase of work should consider not only the technical scope of the works, but also appropriate opportunities for meaningful engagement with First Nations peoples and other project stakeholders. These opportunities should be integrated into the design of the next phase of work, and could be facilitated through a co-design process to ensure that opportunities respond to stakeholder needs and are not overly onerous. Further stakeholder and expert guidance around baseline and scenario projections will be needed in any model refinement process to reinforce credibility and acceptance of outputs, particularly for areas subject to greater levels of uncertainty including OOH populations, longer term housing affordability and mortality improvements.

We see some communication challenges regarding the proof-of-concept scope of the model and stakeholder expectations regarding the level of detail and policy analysis capabilities. The limited scope is appropriate for a proof-of-concept project as model development is very resource intensive and the availability of experts and stakeholders to engage with the modelling process is limited. As such, it has been a useful exercise to first test the approach and modelling capabilities to determine if they provide useful insights on key drivers of change in target outcomes. However, if the project is to advance beyond a proof-of-concept phase, then effective communication of the modelling approach, level of detail, and strengths and limitations to stakeholders will also be important.

As noted by the validators, subsequent plans for use and sharing of the model should focus on how to continue the stakeholder involvement and support user understanding of crucial model elements. This includes considering how users will potentially use the interface and outputs and arrangements that can support this usage, such as 'guided' or collaborative use alongside more experienced users. This will be particularly important for users with less familiarity with modelling approaches and who are not in a position to read or interpret the full technical documentation.

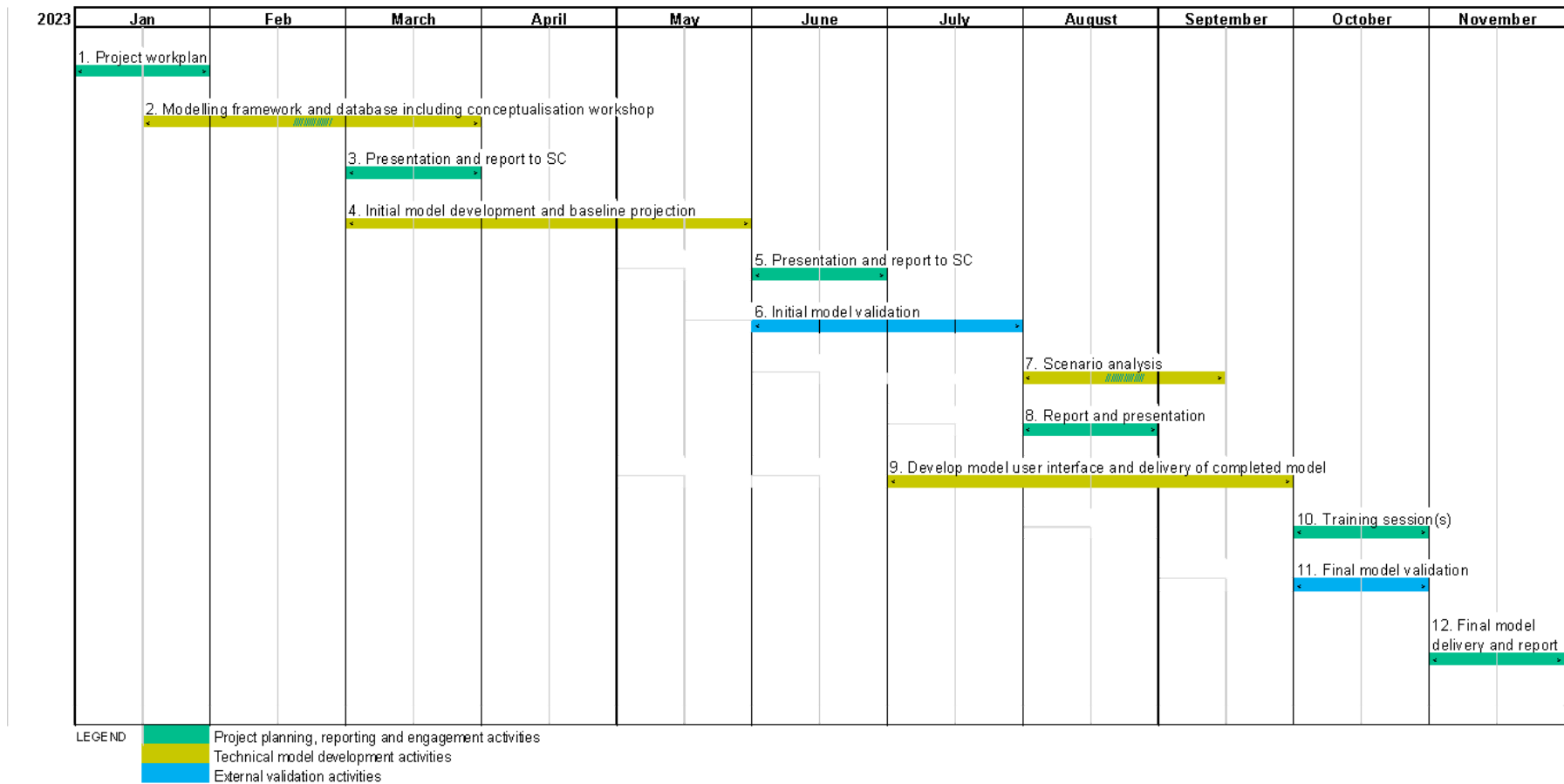
Based on the outcomes and lessons learned from the proof-of-concept phase of the project, we suggest several areas for further consideration in any future phase of model development. Each of these would benefit from further engagement with stakeholders and experts. These include:

1. **Updating or improving the model datasets** – update the model datasets with new data points or with alternative datasets as they become available (e.g. population projections, racism data). Potential priorities for each module are identified in **Table 4** above.
2. **Refining the current model structure:** sense-check the current modules with stakeholder or expert input and further development as needed – particularly child protection and housing modules.
3. **Incorporating new Closing the Gap targets** – extend the model to include 13 additional targets/sub-targets ranked as technically feasible (see **Annex 5**).
4. **Expanding and endogenizing the cultural drivers** – explore the potential to further extend cultural drivers (and make existing drivers endogenous) in the model – either by trying to identify more novel datasets, or using semi-quantitative approaches (e.g. indices or ordinal scales). Potential additional cultural drivers that are not currently included in the model are listed in **Annex 3**.
5. **Extending policy capabilities and introducing Priority Reforms** – develop specific policy interventions or more options for influencing important drivers where sensitivity is high and explore how the Priority Reforms can be introduced into the model.
6. **Developing the user interface** – expand the scope and scenario capabilities and functionality.



Annexes

Annex 1. Project Work Plan – Closing the Gap Modelling Project Milestones and Deliverables



## Annex 2: Overview of the CtG-M Conceptual Framework and Main Modules

Available on Miro at: [https://miro.com/app/board/uXjVMH9ewTc=?share\\_link\\_id=537026297292](https://miro.com/app/board/uXjVMH9ewTc=?share_link_id=537026297292)

## Annex 3: Comparison of drivers identified in the Stakeholder Systems Map and variables in the Closing the Gap Proof of Concept Model

The following tables provide a comparison of the drivers identified through the stakeholder systems mapping for each of the four targets with the variables incorporated into the first model iteration. The variables and terminology used in the model reflect as closely as possible the drivers identified as important by stakeholders. Quantification of these drivers in the model required the identification of suitable datasets. While most drivers are included and quantified in the model, the modelling team was unable to identify datasets in all cases which meant that the driver is represented by an alternative variable in the model, or that the driver is excluded from the first model iteration. Representation of multiple drivers by a single model variable was undertaken in some cases where drivers were closely and directly linked along the same causal pathway and the grouping of these drivers wouldn't alter the model dynamics. For drivers that are currently excluded, these could be readily incorporated into the model if a dataset becomes available.

| TARGET 1: LIFE EXPECTANCY                                       |                                                           |                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|
| DRIVER/VARIABLE FROM SYSTEMS MAP                                | MODEL VARIABLES                                           | EXPLANATION IF NOT EXPLICITLY REPRESENTED |
| <b>Currently Represented in the Model</b>                       |                                                           |                                           |
| Life expectancy                                                 | Life expectancy                                           |                                           |
| Mortality rates by cause                                        | Mortality rates by cause                                  |                                           |
| Leading causes of death                                         | Deaths by cause                                           |                                           |
| Health risk factors                                             | Health risk factors                                       |                                           |
| Preventative health/preventable admissions and avoidable deaths | Average use of healthcare                                 |                                           |
| Access to health services                                       | Average use of healthcare                                 |                                           |
| Availability of culturally safe health services                 | Access to culturally safe healthcare                      |                                           |
| Psychological and spiritual wellbeing                           | Population experiencing psychological distress            |                                           |
| Disability                                                      | Prevalence of disability                                  |                                           |
| Chronic conditions                                              | Prevalence of disability                                  |                                           |
| Racism                                                          | Racism and discrimination                                 |                                           |
| Connection to country/community                                 | Connection to country                                     |                                           |
| Contact with the criminal justice system                        | Contact with the criminal justice system                  |                                           |
| Employment                                                      | Employment fraction                                       |                                           |
| Access to social security                                       | Social security payments                                  |                                           |
| Income                                                          | Average gross per capita income; average household income |                                           |
| Poverty                                                         | Average household income bottom quintiles                 |                                           |
| Wealth                                                          | Average wealth                                            |                                           |
| Access to healthy and affordable food                           | Prevalence of a healthy diet                              |                                           |
|                                                                 |                                                           |                                           |
| <b>Represented through other drivers</b>                        |                                                           |                                           |

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|                                                                     |                                                                  |                                                                                                                        |
|---------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Protection of language                                              | Connection to country; racism and discrimination                 | Driver is represented through model variables for connection to country and racism and discrimination.                 |
| Recognition of cultural authority                                   | Connection to country; racism and discrimination                 | Driver is represented through model variables for connection to country and racism and discrimination.                 |
| Community controlled services                                       | Access to culturally safe healthcare                             | Driver is represented through access to culturally safe healthcare                                                     |
| Intergenerational trauma                                            | Connection to country; racism and discrimination                 | Driver is represented through model variables for connection to country and racism and discrimination.                 |
| Systemic colonisation                                               | Racism and discrimination; connection to country; family support | Driver is represented through model variables for connection to country, racism and discrimination, and family support |
| Cost of living                                                      | Household and per capita income                                  | Driver is represented through variables for income                                                                     |
| Health literacy                                                     | Education level; average use of healthcare                       | Driver is represented through variables for education level and use of healthcare                                      |
| Training of providers, administrators                               | Health staff committed to culturally safe healthcare             | Driver is represented through health staff committed to culturally safe healthcare                                     |
| <b>Currently Not Addressed</b>                                      |                                                                  |                                                                                                                        |
| Equitable funding (ACCO-led commissioning)                          |                                                                  | Unable to identify suitable dataset.                                                                                   |
| Indigenous data sovereignty/new narrative in research and reporting |                                                                  | Unable to identify suitable dataset.                                                                                   |
| Self determination and community leadership                         |                                                                  | Unable to identify suitable dataset.                                                                                   |
| Maternal health                                                     |                                                                  | Outside current model scope (CTG targets 2 and 4)                                                                      |
| Early childhood development                                         |                                                                  | Outside current model scope (CTG targets 2 and 4)                                                                      |

| TARGET 7: YOUTH IN EET                             |                                                                                                                                             |                                                                                                                                     |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| DRIVER/VARIABLE FROM SYSTEMS MAP                   | MODEL VARIABLES                                                                                                                             | EXPLANATION                                                                                                                         |
| <b>Currently Represented in the Model</b>          |                                                                                                                                             |                                                                                                                                     |
| Access to education                                | Education enrolment rates                                                                                                                   |                                                                                                                                     |
| School attendance                                  | Education enrolment rates and dropout rates                                                                                                 |                                                                                                                                     |
| Indigenous youth in education                      | Population age 15-24 in education                                                                                                           |                                                                                                                                     |
| Parental employment and education                  | Adult population by education level; employment fraction                                                                                    |                                                                                                                                     |
| Indigenous youth in employment and training        | Proportion of youth in employment, education, or training                                                                                   |                                                                                                                                     |
| Favourable job market                              | National per capita GDP growth rate; proportion of labour force not employed because of social conditions                                   |                                                                                                                                     |
| <b>Represented through other drivers</b>           |                                                                                                                                             |                                                                                                                                     |
| Training and employment opportunities              | Education enrolment rates; employment fraction; favourable job market; proportion of labour force not employed because of social conditions | Driver partially represented through education enrolment rates, employment rates, favourable job market and barriers to employment. |
| Successful transition from education to employment | Employment fraction; favourable job market; proportion of labour force not employed because of social conditions                            | Driver partially represented through education enrolment rates, employment rates, favourable job market and barriers to employment. |
| <b>Currently Not Addressed</b>                     |                                                                                                                                             |                                                                                                                                     |
| Quality of education                               |                                                                                                                                             | Unable to identify suitable dataset.                                                                                                |
| Digital infrastructure on country                  |                                                                                                                                             | Unable to identify suitable dataset.                                                                                                |
| On country employment opportunities                |                                                                                                                                             | Unable to identify suitable dataset.                                                                                                |
| Community controlled services                      |                                                                                                                                             | Unable to identify suitable dataset.                                                                                                |

|                                                          |  |                                      |
|----------------------------------------------------------|--|--------------------------------------|
| Access to daycare/parental status – children to care for |  | Unable to identify suitable dataset. |
| Support pathways to employment                           |  | Unable to identify suitable dataset. |
| Family and cultural responsibilities                     |  | Unable to identify suitable dataset. |
| Quality of training and capacity of training providers   |  | Unable to identify suitable dataset. |
| Legislative barriers to business development             |  | Unable to identify suitable dataset. |

#### TARGET 9A: APPROPRIATE HOUSING

| DRIVER/VARIABLE FROM SYSTEMS MAP                            | MODEL VARIABLES                                               | EXPLANATION                                                   |
|-------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| <b>Currently Represented in the Model</b>                   |                                                               |                                                               |
| Indigenous population living in appropriately sized housing | Indigenous population living in crowded housing               |                                                               |
| Demand for private housing                                  | Proportion of population with access to private housing       |                                                               |
| Demand for social housing                                   | Population in need of social housing                          |                                                               |
| Social housing supply                                       | Social housing supply                                         |                                                               |
| Private housing supply                                      | Private dwellings occupied by Indigenous people               |                                                               |
| Housing availability                                        | Total Indigenous dwellings                                    |                                                               |
| Housing requiring repairs and maintenance                   | Dwellings of unacceptable standards                           |                                                               |
| Housing affordability                                       | Rental costs for Indigenous households                        |                                                               |
| Access to suitable housing                                  | Access to suitable housing                                    |                                                               |
| Income                                                      | Average per capita income; average household income           |                                                               |
| Persons per household                                       | Average housing unit capacity                                 |                                                               |
| <b>Represented through other drivers</b>                    |                                                               |                                                               |
| Access to energy                                            | Access to suitable housing; dwellings of acceptable standards | Driver is represented through variables for suitable housing. |
| Access to water; water pollution                            | Access to suitable housing; dwellings of acceptable standards | Driver is represented through variables for suitable housing. |
| Cost of living                                              | Per capita and household income                               | Driver is represented through variables for income            |
| <b>Currently Not Addressed</b>                              |                                                               |                                                               |
| Circular mobility                                           |                                                               | Unable to identify suitable dataset.                          |
| Housing security                                            |                                                               | Unable to identify suitable dataset.                          |
| Dry climate                                                 |                                                               | Beyond model scope.                                           |

#### TARGET 12: CHILDREN IN OOHC

| DRIVER/VARIABLE FROM SYSTEMS MAP                  | MODEL VARIABLES                                                  | EXPLANATION |
|---------------------------------------------------|------------------------------------------------------------------|-------------|
| <b>Currently Represented in the Model</b>         |                                                                  |             |
| Indigenous children in OOHC                       | Indigenous children in OOHC                                      |             |
| Children on care and protection order             | Child substantiations                                            |             |
| Contact with child protection services            | Child substantiations; Indigenous children in OOHC               |             |
| Strong family support                             | Family support                                                   |             |
| Reunification                                     | Safe reunification with family                                   |             |
| Parental unemployment                             | Employment fraction                                              |             |
| Children at risk of abuse or neglect              | Risk of child abuse or neglect                                   |             |
| Parental contact with the criminal justice system | Proportion of adults in contact with the criminal justice system |             |

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|                                                   |                                                      |                                                                                 |
|---------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------|
| Parental mental health                            | Proportion of population with psychological distress |                                                                                 |
| Parental alcohol or substance use                 | Substance use                                        |                                                                                 |
| Domestic and family violence                      | Proportion of people experiencing physical harm      |                                                                                 |
| Racism and discrimination                         | Racism and discrimination                            |                                                                                 |
| Education                                         | Adult population by education level                  |                                                                                 |
| Access to suitable housing                        | Access to suitable housing                           |                                                                                 |
| <b>Represented through other drivers</b>          |                                                      |                                                                                 |
| Access to culturally safe family support services | Racism and discrimination                            | Driver is partially represented through variable for racism and discrimination. |
| Legislative barriers                              | Racism and discrimination                            | Driver is partially represented through variable for racism and discrimination. |
| Misidentification                                 | Racism and discrimination                            | Driver is partially represented through variable for racism and discrimination. |
| <b>Currently Not Addressed</b>                    |                                                      |                                                                                 |
| Transparency of child protection system           |                                                      | Unable to identify suitable dataset.                                            |
| Trust in child protection system                  |                                                      | Unable to identify suitable dataset.                                            |
| Delegated authority                               |                                                      | Unable to identify suitable dataset.                                            |

## Annex 4. Closing the Gap Proof of Concept Model – Response to Second External Validation and Stakeholder Feedback

| MODULE                                         | SPECIFIC REVISIONS IDENTIFIED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SOURCE | RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | STATUS    |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3. Mortality</b>                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |
| Mortality rates                                | <p>Mortality rate inputs have been updated to align much more closely with recent ABS/AIHW observations. This particularly applies to infant and under age 5 mortality rates which were previously much higher than expected.</p> <p>We observed that some larger variations remain for older age groups (ages 55 and over). The scale of these impacts is considerably smaller compared to Phase 1 where all age groups and especially younger ages had variations. We suggest potentially flagging these as an area for future refinement.</p>                                                                                                                                                                                                         | p18    | The calibration for the age-specific mortality rates has been improved in the latest model iteration, with reduced error. We have noted in the project report that further refinements could be made in future when new data becomes available.                                                                                                                                                                                                                                | Noted.    |
| Life expectancy gap                            | <p>Outputs continue to be reasonably close to calibration data.</p> <p>An important observation is that the life expectancy gap is projected to gradually increase after around 2030. This is because the current modelling approach does not assume any mortality improvements for the Indigenous population (over what is projected from shifts to drivers), whereas ABS mortality improvements are built into non-Indigenous life expectancy projections. This is the same approach applied by ABS to their life expectancy estimates but may potentially lead to misinterpretation of the implications of projected output. Displaying the stable projections of Indigenous life expectancy alongside gap projections may help to mitigate this.</p> | p18    | The projections of indigenous and non-indigenous life expectancy projections have been included as a plot on the interface to display the LE gap in relation to absolute life expectancy projections. Future assumptions for the trend in non-Indigenous life expectancy could be further reviewed and discussed.                                                                                                                                                              | Noted.    |
| <b>4. Health</b>                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |
| Scenarios involving increased ACCHO healthcare | <p>The current interface applies scenario input for 'future ACCHO % change' to the metro population only, however the documentation does not specify that this Priority Reform scenario only applies to metro areas.</p> <p>If this scenario is intended to apply to all areas, we suggest that the modelling team adjust the scenario configuration. If this scenario is intended for metro areas only then documentation updates would clarify this for users.</p>                                                                                                                                                                                                                                                                                     | p18    | This was not intended and has been corrected so it applies to all areas. The degree remoteness can be selected using the drop-down list next to the sub-heading on the interface. Note this only applies for 'social housing supply yearly growth' and 'ACCHO healthcare yearly growth'.                                                                                                                                                                                       | Completed |
| Elasticity of healthy diets to income          | <p>The calibrated elasticity of healthy diets to income is now negative, implying that the prevalence of healthy diets decreases as average incomes increase. This does reflect a decrease between 2012 and 2018 survey observations but may be counterintuitive to the positive relationship suggested by the evidence base.</p> <p>Suggest potentially flagging this as an area for future revision.</p>                                                                                                                                                                                                                                                                                                                                               | p18    | This has been adjusted in the final model by introducing a quadratic relationship. Previous studies on the relationship between diet and income have shown that increasing income levels can initially result in poorer diets (and higher obesity), until more healthier diets are established at higher income levels. This relationship is now incorporated into the model. This approach could be further reviewed along with the proxy dataset used for calibrating diets. | Completed |

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|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Future assumptions on racism and discrimination | Future assumptions for racism assume the trend decreases linearly over time, this assumption may need to be revised and further tested in the absence of data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     | Data for racism and discrimination is limited and the proxy used is the 'proportion of indigenous persons that were treated unfairly based on race' (AIHW HPF Table D1 1.13.4 & 1.13.11). Future assumptions for this variable have now been adjusted to a constant trend. This can be adjusted by users in the interface to explore the effects of different assumptions.                                                                                                                                                                                                                   | Completed  |
| <b>5. Education</b>                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| Simulation of EET rates                         | <p>Compared to 2021 Census observations, projected EET rates are:</p> <ul style="list-style-type: none"> <li>► Slightly higher but broadly comparable for metro and regional areas</li> <li>► Significantly higher for remote areas (e.g. 15 percentage points in 2021)</li> </ul> <p>The projections also show an increasing trend that is broadly reasonable for metro and regional areas but inconsistent with historic data for remote populations, where youth EET rates have remained at roughly similar levels over 2008-21.</p> <p>These differences are largely driven by differences in projected education participation rates. The modelling team have suggested that these have arisen as a result of the data used to calibrate attainment rates (see below), which will be reviewed.</p> <p>Calibration or review against Census 2006-21 observations for youth EET and education participation rates may also help to refine projections for remote populations.</p> | p16 | New data has been incorporated for 2021 for EET and the model has been recalibrated. The initial values for 'initial net enrolment rate by level' were also corrected after noticing a mismatch between the model and the data. Education completion rates were additionally recalibrated bringing EET closer to the data (see below)                                                                                                                                                                                                                                                        | Completed. |
| Education attainment calibration data           | <p>The Education module is calibrated to secondary and tertiary education attainment rates from 2006, 2011 and 2016 Census waves but not to 2021 Census observations. This may be contributing to overstated projected enrolment rates, as the model calibration assumes the sizeable increase in secondary attainment between 2011 and 2016 continues until after 2026.</p> <p>An important contextual factor is that the minimum school leaving age was increased to 17 in all states and territories in 2010. It is likely that this is the main driver of the large increase between 2011 and 2016 and that this is a one-off effect.</p> <p>If the growth observed over 2016-2021 is expected to be a more reliable indicator of future increases in educational attainment and enrolment, then we suggest incorporating 2021 calibration values or other judgement-based adjustments to moderate assumed future growth in tertiary enrolment rates.</p>                        | p16 | We have updated the education data with new data points for secondary completion & tertiary completion rates in 2021 from the PC dashboard for target 5 and target 6. The model was recalibrated using this latest data which has resulted in more modest projections for completion rates. The data provided by EY on education participation for variable 'proportion of population aged 15-24 in education' was also incorporated into the model and was useful for comparison, though it was not included for calibration purposes as it only consists of two data points (2016 & 2021). | Completed. |
| Scenarios involving enrolment                   | Scenario impacts are currently constrained by the projection of very high net tertiary enrolment rates that start at 100% and after a temporary dip return to levels over 90% (metro) and 85% (regional) by 2017 onwards. Remote tertiary enrolment rates also increase. These enrolment rates are considerably higher than expected and constrain the scale of enrolment increases that can be modelled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | p17 | The updated and recalibrated module now addresses these issues (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Completed. |

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|                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|                                                               | Refer to commentary around dropout and enrolment rate inputs for recommendations (see commentary below).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| Enrolment and dropout rates                                   | <p>Dropout rate assumptions remain at very low levels while the elasticities have been recalibrated.</p> <p>Inputs for 'initial net enrolment rate by level' for tertiary education have been increased to reflect VET as well as university enrolments. This aligns with Phase 1 recommendations, however the scale of the increase is higher than expected (increased to 43% for remote and 100% for other areas).</p> <p>These assumption variations contribute to overstated net enrolment rates and reduced sensitivity of EET rate simulations to scenarios where enrolment drivers improve (see commentary above). However, the impact on baseline output accuracy has been moderated by the new "overlap factor" variable used in the calculation of educational participation rates. This essentially adjusts for the difference between net enrolment rates and calibration data, and implicitly offsets some of the impact of tertiary dropouts and overstated enrolment rates.</p> <p>We suggest flagging this area for future refinement, particularly if the targets are expanded to include attainment rates or if policy scenarios are expanded to consider initiatives that improve retention rates.</p> | p17 | <p>Several updates in the education module corrected these outcomes, including updating the 'initial net enrolment' values, adding 2021 data and recalibrating education completion rates, employment and EET. As per our response to Phase 1, we have reviewed the data for dropouts and it does not appear to be comparable with the way that this is formulated in the model. We have flagged this as an area for future model development to support policy scenarios addressing retention rates.</p>                                                                                                                                                                                                                                                                                                                                                                                    | Completed. |
| <b>6. Child Protection</b>                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| OOHC projections                                              | <p>Population projections now align more closely to ABS population forecasts, and so prevalence and count measures are now more aligned.</p> <p>The proportion of children in OOHC projected for metro and regional areas reduces after 2020 (the projected number of children in OOHC remains stable or decreases slightly while the population increases). Remote projections remain similar to the previous model iteration. This reflects assumed increases in family support over time.</p> <p>We suggest that external input and guidance around future potential shifts in OOHC could be helpful in sense checking these projections. This module is affected by scarce data around key drivers (e.g. family support, substance use) and external factors that are difficult to reflect in projections (e.g. policy and operational shifts, data recording variations) to a greater extent than other modules.</p>                                                                                                                                                                                                                                                                                                 | p18 | <p>Following discussion with EY and NIAA, previous estimates for the initial values of 'children in OOHC' were considered to be too low, and these values have been adjusted and updated. Noting the comments from EY and also the outcomes from the sensitivity analysis on the previous model iteration which showed very high sensitivity of the projections to changes in family support, some further refinements have been made to the module and it has been recalibrated. This includes some adjustments to important drivers (e.g. access to suitable housing and psychological distress) and recalibration of the family support driver. This has reduced sensitivity of the projections. However, this module would benefit from further review and development with experts and stakeholders which may yield additional drivers and datasets to improve the model structure.</p> | Completed  |
| <b>7. Housing</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| Scenarios involving increased social housing supply or income | <p>Remote overcrowding rates now show greater sensitivity to social housing supply scenarios, which appears reasonable.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     | <p>Some adjustments have been made to the housing module to better account for the effects of housing affordability on future projections for cities and regional areas and the flow-on effect for social housing demand. This has improved the calibration</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Completed  |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                |            |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|                                                   | <p>Metro and regional overcrowding rates show relatively little improvement under policy scenarios involving increased social housing supply or increased income. This differs from the scale of the change expected and arises from an assumed increasing trend in private housing affordability (resulting in a sharp drop-off in social housing demand). We tested and confirmed that if the model assumes a higher proportion of the population in social housing then scenario outputs show greater sensitivity to social housing supply increases.</p> <p>The modelling team have confirmed this is an area currently under consideration. We suggest that external input and guidance around future potential shifts in metro and regional housing affordability could be helpful in sense checking these projections and some of the underlying calibrations.</p> |     | and the sensitivity of the projections for crowding, however the impact of increased social housing supply still remains more important in remote areas. This is intuitive given the larger population in these areas living in social housing. However, further external input from stakeholders and experts would be helpful to sense check the projections and assumptions. |            |
| <b>8. Income</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                |            |
| Calculations – Effect of GDP growth on employment | <p>The calibrated 'effect of GDP growth rate on employment' variable is positive (which conceptually is reasonable), however this is applied to the unemployed population in the calculation of 'employed fraction', and results in a negative relationship between GDP growth increases and employment rates. This appears counterintuitive.</p> <p>Suggest potentially flagging this as an area for future revision.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                | p18 | This was a minor model formulation error which has now been corrected.                                                                                                                                                                                                                                                                                                         | Completed  |
| Employment and youth employment calibration data  | <p>Calibration data for regional employment rates for 2021, 2016 and previous years is slightly smaller than expected compared to Census observations (e.g. 9 percentage points lower in 2021).</p> <p>We also observed that Census data is available for youth employment rates for at least 2016 and 2021 and could potentially support improvements to the calibration of youth employment and EET rates. At present projected metro and regional youth employment rates are smaller than Census observations in 2021 (8 and 13 percentage points respectively) but are offset by education participation rates.</p> <p>We recommend flagging this as an area for potential future refinement alongside education participation rates.</p>                                                                                                                             | p18 | The employment fraction data was updated to include the 2021 data point from the most recent AIHW HPF (July 2023). Data on the 'youth employment fraction' is not currently used in the model but has been identified as a potential area for further refinements.                                                                                                             | Completed. |
| <b>Documentation updates</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                |            |
| Include updates for recent model revisions        | We suggest updating these areas at some future point. Areas to update include: Population (net migration approach) and Education (change to participation rate approach and reduced role of gross enrolment rates). The Education summary CLD diagram could also include a link from employment to target 7.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | p21 | Documentation and diagrams updated.                                                                                                                                                                                                                                                                                                                                            | Completed  |
| Population description                            | <p>Population – update commentary</p> <p>The description of the approach and assumptions used to project net internal migration could be updated to reflect revisions during Phase 2. Specifically, that historic internal migration is</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | p43 | Documentation has been updated.                                                                                                                                                                                                                                                                                                                                                | Completed. |

|                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| assumed to flow from other areas to remote in the current model (the documentation currently states the reverse) and that no internal migration is currently projected beyond 2023. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |
| Variable sources                                                                                                                                                                    | <p>Various modules</p> <p>Some of the inputs used appear to be either arbitrary or judgement-based inputs to initialise variables for calibration, or endogenous variables set in a previous calibration iteration not visible in the current optimisation setup. It may be helpful for future model owners if this approach and any supporting data sources were noted for reference, as it is otherwise unclear where the inputs come from. (Note this could be in a separate file note rather than the main model documentation). Examples of calculations which use these inputs include:</p> <ul style="list-style-type: none"><li>► Fertility: Fertility rates and paternity rate ratios</li><li>► Mortality: Mortality rate distribution</li><li>► Health: Healthy diets and income, substance use rehabilitation</li><li>► Child Protection: Child neglect and youth justice supervision</li><li>► Housing: Additional people per household, social housing duration</li><li>► Income: Multiple inputs, including social benefits distributions, reference salary and employment inputs, savings inputs</li></ul> | p43 | <p>The model documentation includes data sources for all datasets used in the model. The variables identified here are generally intermediate variables calculated endogenously in the model or they are estimated during the calibration process, as such they are not underpinned by datasets. These variables are necessary as part of the model formulation but do not have calibration datasets.</p> <p>Fertility - As noted in Table 3.2 in the model document, data on fertility rates is from the ABS and we also note in the description that paternity rates are estimated using an optimised parameter in the calibration process.</p> <p>Mortality – endogenously estimated.</p> <p>Health – calibration data is for the prevalence of a healthy diet is provided in Table 3.4. Substance use rehabilitation is a necessary flow variable in the stock formulation which is calibrated using data on prevalence of substance use (source also in Table 3.4).</p> <p>Child protection – risk of child neglect is an intermediate variable based on our conceptual model which is estimated using data for other drivers (see Table 3.6) but is not itself underpinned by data. Data used for youth under justice supervision is listed in Table 3.6.</p> <p>Housing these parameters are estimated in the model using calibration data listed in Table 3.7. They are not underpinned by data.</p> <p>Income: again, these variables are estimated during the optimisation process based on the calibration data used in the model. They are not based on datasets but are necessary for the model formulation.</p> | Noted. |
| Variable names                                                                                                                                                                      | <p>Income – update labelling</p> <p>Variables labelled as 'per capita' or individual income have been calibrated to equivalised household income data sources. The modelling team advised that individual income data was limited in terms of remoteness and time-series availability and data on household income was more widely available, so has been used for consistency throughout the model. We suggest the documentation and model variable labels be updated to reflect this.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     | <p>The data source for this variable is listed in Table 3.8. We consider equivalised household income is a suitable proxy here as there is a better timeseries available. While it is different to per capita income, the equivalisation means that it is an indicator of the economic resources available to each individual in a household.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Noted. |

| User Interface Updates                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Structure, layout and navigation options    | <p>Potential improvements to the overall structure, layout and navigation options include:</p> <ul style="list-style-type: none"> <li>► Shading to indicate the section of the interface the user is currently viewing could be helpful.</li> <li>► Expanding the use of 'BACK' and 'NEXT' buttons for all pages in larger sections. This includes the 'MODEL' section, where the 'BACK' button currently returns the user to the start of the 9-page section rather than to the previous page.</li> <li>► Displaying the model limitations clearly in their own section, rather than as a subsection of the Simulation section via the 'Assumptions' page, so as to increase its visibility to the user.</li> </ul>                                                                                                                                                                                 | P23      | Inserted shading for the interface tabs. Expanded Back & Next buttons to improve navigation. Added an 'assumptions' tab to the main menu to access model assumptions and limitations more directly.                                                                                                                                                                                                                                                                                                | Completed |
| Output display and simulation functionality | <p>The graphic displays accurately reflect underlying model outputs, with one exception for the Target 12 (OOHC population) section that displays a table of values for Target 7 instead. The current interface applies scenario input for increased access to ACCHO culturally safe healthcare to the metro population only. If this scenario is intended to apply to all areas then the scenario configuration requires adjustment; otherwise we suggest updates to clarify this in the documentation and interface.</p> <p>Some minor potential improvements have been identified to enhance:</p> <ul style="list-style-type: none"> <li>► useability, functionality and clarity of user understanding of outputs, particularly those from the Assumptions section</li> <li>► graph formatting and labelling</li> <li>► user understanding of functionalities to delete and stash runs</li> </ul> | P22 & 23 | <p>Made relevant corrections. Corrected the table for Target 12 &amp; the ACCHO policy functions.</p> <p>The current software version does not allow the user to delete, and stash runs manually through the interface. User can select 'restore' to return to default model settings.</p>                                                                                                                                                                                                         | Completed |
| Simulation functionality                    | <p>For policy scenarios, it may be helpful to provide the user with a table of scenario input values as well as the graphs, to provide easier visibility over the exact values they input via the graphical tool (e.g. this could be included using the functionality to include multiple graphs/tables in the same object).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | P24      | Policy scenarios can be set up in different ways, though it is suggested by NIAA to use levers for the policy scenarios as opposed to a graphical or tabular input.                                                                                                                                                                                                                                                                                                                                | Completed |
| Simulation functionality                    | <p>Some aspects of the Assumptions functionality may not be obvious or could be misinterpreted by users, particularly those with limited knowledge of the documentation or modelling development process.</p> <p>Some of the suggestions below may help to mitigate this risk:</p> <ul style="list-style-type: none"> <li>► Clarify the illustrative nature of the sensitivities in the Assumptions page description.</li> <li>► Add a brief explanation for each driver to describe what it is intended to represent, and to caveat outputs which involve very large sensitivity movements as less reliable.</li> <li>► Display the baseline and post-sensitivity driver values over the projection period.</li> <li>► Consider if the use of incremental changes (rather than multiplicative) provides for more appropriate constraints on 'extreme' scenario inputs.</li> </ul>                   | P25      | <p>The 'Assumptions' page has been updated to include a brief explanation for each driver and the associated data proxy.</p> <p>Baseline graphs for the assumptions have been included to display the baseline and post-sensitivity driver values over the projection period.</p> <p>The structure for assumptions levers were also updated to introduce incremental annual growth changes.</p> <p>An additional tab was included to display the sensitivity results for the main CTG targets.</p> | Completed |

## MONASH SUSTAINABLE DEVELOPMENT INSTITUTE - CLOSING THE GAP MODELLING

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Formatting and labelling            | <b>Dropdown boxes:</b> Adjustments could help to make it clearer to users that gender and regional category filters are only linked to some target graphs, not all (e.g. gender filter only applies to Target 1 (LE gap) and the remoteness filter only applies to Target 1 (LE gap), Target 7 (EET rates) and Target 9 (housing). Additionally, it is not clear that the ACCHO-related Health scenario policy is disaggregated by remoteness, although briefly noted in a page note. This could benefit from the use of a symbol labelling system or a similar measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | P25  | Corrected. The simulation page now displays the targets at a national scale, whereas results for levels of remoteness can be viewed for each target separately.                                                                                                                                                                                                                                                                                                                                                      | Completed |
| Graph formatting                    | <ul style="list-style-type: none"> <li>▶ Adjustments to y-axes to consistently start from zero and have a specified range set for each graph may help to support comparisons between different subcohorts and runs</li> <li>▶ Limiting the number of decimal places (e.g. to 1-2) may help support clearer axis labels</li> <li>▶ Alternative 'plain English' y-axis labelling in place of the current default 'dmnl'</li> <li>▶ Target 1 (life expectancy gap) graphs currently have the same 'Year' label for both x and y axes which might be confusing for users. 'Age years' could be used for the y-axis instead.</li> <li>▶ Adjustments to the x-axis of input graphs for ACCHO and healthcare access increases to commence from 2024 (rather than 2006)</li> <li>▶ Use of different colours and patterns to differentiate between chart lines for historic data versus the first simulation run output. Currently they appear to both use the same pattern which can make it difficult to distinguish between the two chart lines in the graphs.</li> <li>▶ Alternative names for auto-generated simulation run names (currently 'Run 3213', 'Run 3214' etc.) or possibly an option for users to input their own run names.</li> </ul> | P26  | Made relevant corrections and inserted a button which allows one to rename runs.                                                                                                                                                                                                                                                                                                                                                                                                                                     | Completed |
|                                     | It would be nice to get rid of the 'graphics frame error' that pops up when opening the model, but unsure of how                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      | We're not sure what this comment refers to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Noted.    |
| <b>Interface comments from NIAA</b> | <p>We might need to change the (i) to something a bit clearer.</p> <p>Include aggregate graphs (total population (male and female, all remoteness areas)).</p> <p>Graph in the top-right – we need clarification on what this represents.</p> <p>Need a title that is clearer/more meaningful than "PC target data" in the graph.</p> <p>Include date the data were sourced somewhere (as it gets updated regularly).</p> <p>The table page lets you copy and paste the data, but it takes a bit of figuring out how to do this – needs to be clearer.</p> <p>Y-axis: "Years" instead of Year.</p> <p>Question for our team: Does the calibration story need to be in there? (Most likely answer: Probably not – can be addressed with confidence intervals.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NIAA | <p>Updated the information icon throughout the interface.</p> <p>Included aggregated results on the main simulation page.</p> <p>Corrected</p> <p>Adjusted titles and legends to clarify graph descriptions</p> <p>Noted and included.</p> <p>This is mentioned in the info icon on page: CTG 1 Graphs.</p> <p>Noted and corrected</p> <p>The confidence bounds are displayed on the sensitivity plots, but not on the comparative results plots to avoid confusion by having too many runs displayed on a graph</p> | Completed |

|                                                                                                                                                                        |                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| We need to look for the number of children in OOHC in 2006 (PC doesn't have this).                                                                                     | Noted and corrected.                                                                 |
| Need to standardise all graphs for 0 on Y axis.                                                                                                                        | Additional corrections were made in the interface to address the remaining comments. |
| Dmnl = Dimensionless (needs clarification).                                                                                                                            |                                                                                      |
| Can we change the Run #### title to something more meaningful?                                                                                                         |                                                                                      |
| We need housing policy scenario for the whole country, not just remote areas.                                                                                          |                                                                                      |
| The units are wrong on the table for Target 12 – unsure if this is just a temporary glitch?                                                                            |                                                                                      |
| Needs to be clearer what the % change is on Y axis.                                                                                                                    |                                                                                      |
| The x axes are different for the different policy options (one starts at 2006, others start at 2024).                                                                  |                                                                                      |
| Kind of difficult to create the % change projections in graphs. Can we impose policy scenarios in numbers rather than graphs – like with the adjusting of assumptions? |                                                                                      |
| Is there an ability to see the change over time in disability, income or other variables?                                                                              |                                                                                      |

## Annex 5: Remaining CtG targets and indicators and feasibility to model

**Rating = 1. Low hanging fruit; 2. Feasible (2P=policy/exogenous); 3. Very challenging or not realistic**

| Target                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Indicator                                                                                                                                                                                                                                                                                                  | Technical Feasibility |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Target 2:</b> By 2031, increase the proportion of Aboriginal and Torres Strait Islander babies with a healthy birthweight to 91 per cent.                                                                                                                                                                                                                                                                                                                                                                                        | The proportion of Aboriginal and Torres Strait Islander babies with a healthy birthweight.                                                                                                                                                                                                                 | 2                     |
| <b>Target 3:</b> By 2025, increase the proportion of Aboriginal and Torres Strait Islander children enrolled in Year Before Full time Schooling (YBFS) early childhood education to 95 per cent.                                                                                                                                                                                                                                                                                                                                    | The proportion of Aboriginal and Torres Strait Islander children in the state-specific YBFS age cohort who are enrolled in a preschool program.                                                                                                                                                            | 2                     |
| <b>Target 4:</b> By 2031, increase the proportion of Aboriginal and Torres Strait Islander children assessed as developmentally on track in all five domains of the Australian Early Development Census (AEDC) to 55 per cent.                                                                                                                                                                                                                                                                                                      | The proportion of Aboriginal and Torres Strait Islander children assessed as developmentally on track in all five domains of the AEDC (physical health and wellbeing; social competence; emotional maturity; language and cognitive skills (school-based); and communication skills and general knowledge) | 3                     |
| <b>Target 5:</b> By 2031, increase the proportion of Aboriginal and Torres Strait Islander people (20-24 years old) attaining Year 12 or equivalent qualification to 96 per cent.                                                                                                                                                                                                                                                                                                                                                   | The proportion of Aboriginal and Torres Strait Islander people aged 20-24 years who have attained a minimum of Year 12 or equivalent, or Certificate level III or above qualification.                                                                                                                     | 1                     |
| <b>Target 6:</b> By 2031, increase the proportion of Aboriginal and Torres Strait Islander people aged 25-34 years who have completed a tertiary qualification (Certificate level III and above) to 70 per cent.                                                                                                                                                                                                                                                                                                                    | The proportion of Aboriginal and Torres Strait Islander people aged 25-34 years old who have completed qualifications at Certificate level III or above.                                                                                                                                                   | 2                     |
| <b>Target 8:</b> By 2031, increase the proportion of Aboriginal and Torres Strait Islander people aged 25-64 who are employed to 62 per cent.                                                                                                                                                                                                                                                                                                                                                                                       | The proportion of Aboriginal and Torres Strait Islander people aged 25-64 years who are employed.                                                                                                                                                                                                          | 1                     |
| <b>Target 9b:</b> By 2031, all Aboriginal and Torres Strait Islander households:<br>i. within discrete Aboriginal or Torres Strait Islander communities receive essential services that meet or exceed the relevant jurisdictional standard<br>ii. in or near to a town receive essential services that meet or exceed the same standard as applies generally within the town (including if the household might be classified for other purposes as a part of a discrete settlement such as a "town camp" or "town based reserve"). | The proportion of Aboriginal and Torres Strait Islander households receiving essential services that meet or exceed standards                                                                                                                                                                              | 2P                    |
| <b>Target 10:</b> By 2031, reduce the rate of Aboriginal and Torres Strait Islander adults held in incarceration by at least 15 per cent.                                                                                                                                                                                                                                                                                                                                                                                           | Age-standardised imprisonment rate.                                                                                                                                                                                                                                                                        | 1                     |
| <b>Target 11:</b> By 2031, reduce the rate of Aboriginal and Torres Strait Islander young people (10–17 years) in detention by at least 30 per cent.                                                                                                                                                                                                                                                                                                                                                                                | The rate of Aboriginal and Torres Strait Islander young people aged 10–17 years in detention.                                                                                                                                                                                                              | 1                     |
| <b>Target 13:</b> By 2031, the rate of all forms of family violence and abuse against Aboriginal and Torres Strait Islander women and children is reduced at least by 50 per cent, as progress towards zero.                                                                                                                                                                                                                                                                                                                        | Proportion of Aboriginal and Torres Strait Islander females aged 15 years and over who experienced domestic physical or threatened physical harm in the last 12 months.                                                                                                                                    | 2                     |
| <b>Target 14:</b> A significant and sustained reduction in suicide of Aboriginal and Torres Strait Islander people towards zero.                                                                                                                                                                                                                                                                                                                                                                                                    | Suicide death rate of Aboriginal and Torres Strait Islander people.                                                                                                                                                                                                                                        | 2                     |
| <b>Target 15:</b> By 2030, a 15 per cent increase in:<br><ul style="list-style-type: none"> <li>Australia's land mass subject to Aboriginal and Torres Strait Islander people's legal rights or interests (Target 15A)</li> <li>Australia's sea waters subject to Aboriginal and Torres Strait Islander people's legal rights or interests (Target 15B).</li> </ul>                                                                                                                                                                 | Area of Australian land mass and sea waters that is subject to Aboriginal and Torres Strait Islander people's legal rights or interests.                                                                                                                                                                   | 2P                    |
| <b>Target 16:</b> By 2031, there is a sustained increase in number and strength of Aboriginal and Torres Strait Islander languages being spoken.                                                                                                                                                                                                                                                                                                                                                                                    | The number and strength of Aboriginal and Torres Strait Islander languages being spoken                                                                                                                                                                                                                    | 2                     |
| <b>Target 17:</b> By 2026, Aboriginal and Torres Strait Islander people have equal levels of digital inclusion.                                                                                                                                                                                                                                                                                                                                                                                                                     | Proportion of Aboriginal and Torres Strait Islander people aged 15 years and over who have accessed the internet at home in the last 12 months.                                                                                                                                                            | 3                     |